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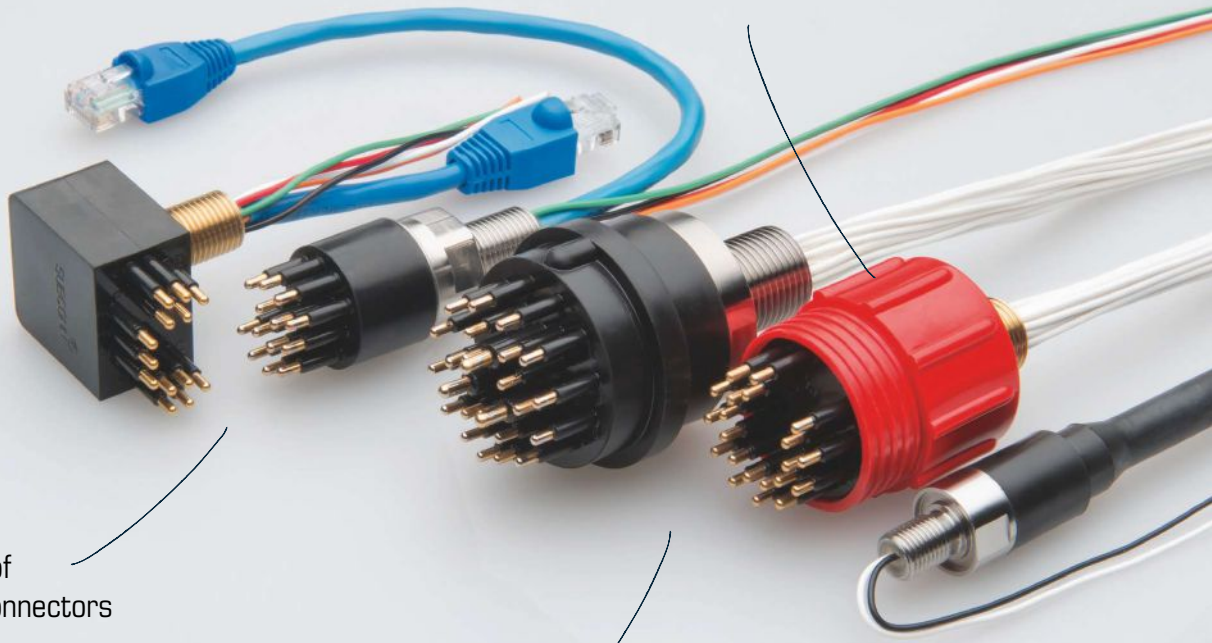

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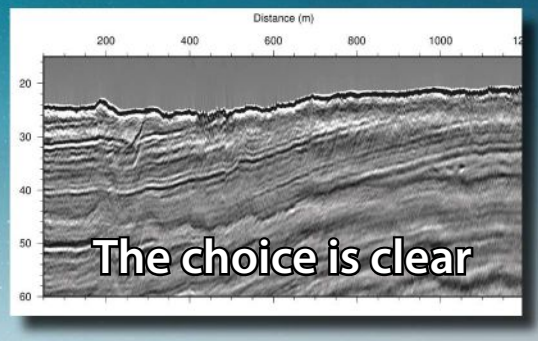

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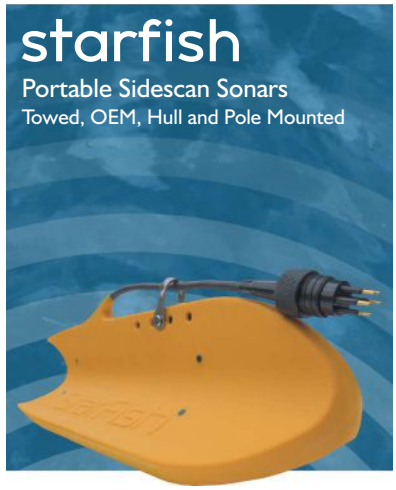

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editorial

***David Helvarg**, Blue Frontier; **Jason Scorse**, Middlebury College*

Why a Green Climate Deal Needs More Blue

From Texas to Alaska, Saipan to the Florida Keys, sea level rise and intensified hurricanes are making our coastlines more dangerous and unstable. At the same time, most of the U.S. population and the majority of the nation's economic activity is now located in coastal states. This is why we need to put the "blue" front and center in any major climate action plans, such as the proposed and widely discussed Green New Deal (GND).

GND addresses the climate crisis with policies to achieve net-zero greenhouse gas emissions and 100 percent renewable energy by 2030. It was introduced to the U.S. Senate earlier this year, but was voted down by Republicans. GND is expected to be up for debate in the 2020 U.S. presidential campaign.

For most of U.S. history, the shoreline was viewed as a chaotic and unpredictable place, best fit for fishing (and whaling), shipbuilding, trading ports and the poor. Some of today's most iconic coastlines were once populated almost exclusively by immigrants, including the Italian fishermen and Mexican cannery workers of Monterey, California, and the African-American Gullah Geechee communities of the South Carolina and Georgia sea isles.

When, in the late 19th and early 20th century, the wealthy were attracted to living by the ocean, including on storm-barrier islands, followed by coastal land rush developers whose hotels, second homes and rental units were subsidized by the 1968 National Flood Insurance Act, a process of ecological decline began.

Today the U.S. coast's natural protections, including dunes, salt marshes, coral and oyster reefs, mangroves and sea grasses, are extremely fragmented and less resilient to the growing impacts of climate change. That's why any Green New Deal must be built on opportunities around coastal adaptation, mitigation and habitat protection. A focus on the blue economy can improve the quality of life for millions of Americans in coastal states and territories, while also providing powerful benefits in terms of jobs, environmental improvement and social equity for the entire nation.

Our report, published in the environmental science news journal *Mongabay* (tinyurl.com/y4pccg57), outlines eight priorities for making the coasts more resilient and developing the blue economy. We call for a complete reformation of the National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Agency; major coastal infrastructure investment, focusing on protection and restoration of natural barriers and coastal habitats; new guidelines and systems for expanding offshore renewable energy production; new forms of assistance to ports and fishing communities; a network of marine protected areas like National Parks in the sea; increased aquaculture investment; and a revised National Disaster Recovery Framework, including creation of a new combatant command within the Department of Defense.

The most recent U.S. National Climate Assessment, a report produced by 13 federal agencies including the Department of Defense, suggests that up to 50 percent of projected coastal damage from climate disruption in this century can be mitigated through good planning. The agenda we're proposing could yield even greater returns on our nation's investment.

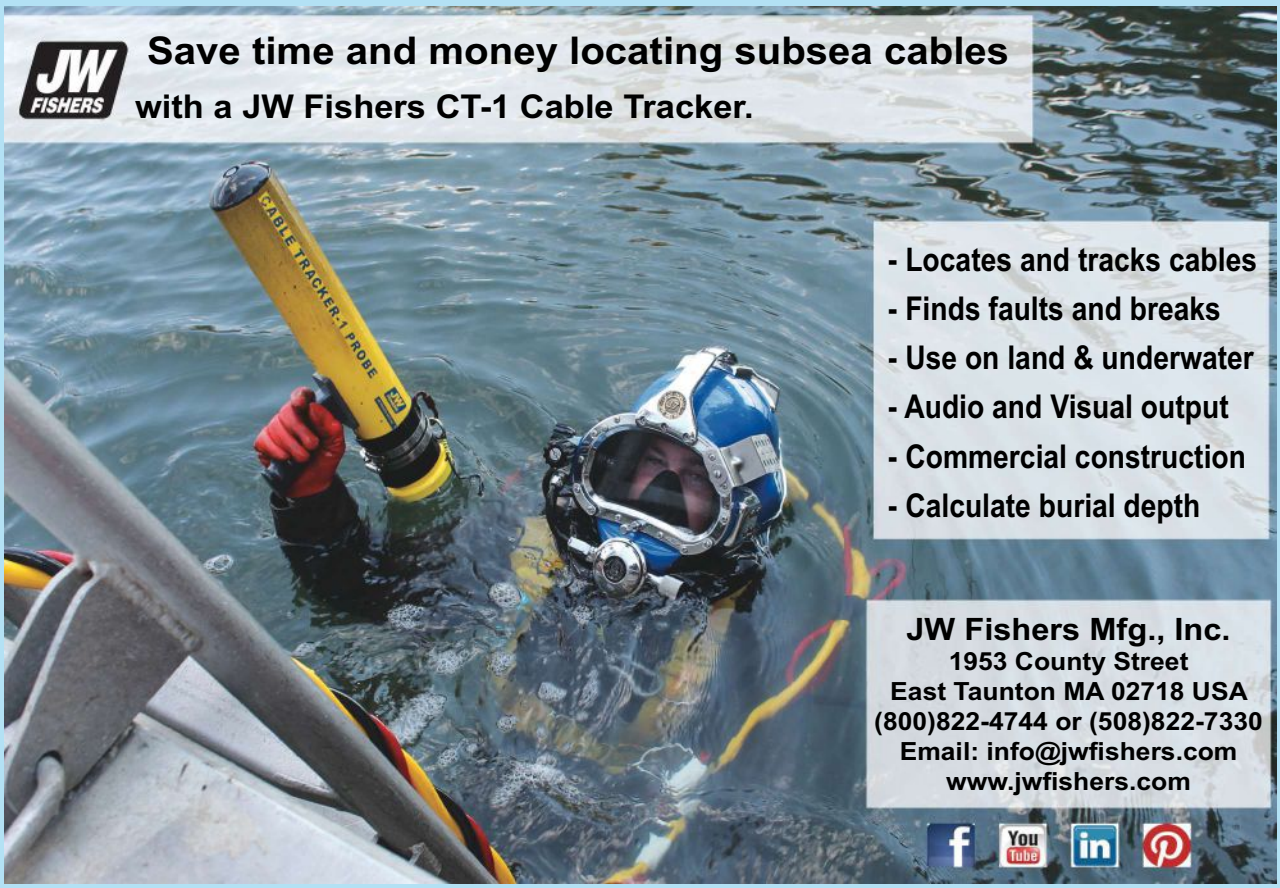
Without major reforms, the threat from climate change will continue to devastate our most vulnerable populations. Whether it be low-income communities of color in coastal Texas and Louisiana, Native Alaskans currently losing their villages in northern and western Alaska, or urban and island communities from Far Rockaway, New York, to Puerto Rico whose people are still recovering from 2017's Hurricane Maria, our proposals will promote justice and equity while strengthening the national economy.

The challenge is to mobilize the political will to enact climate solutions. To address the existential threat of climate change to our coasts, public seas and the larger society, we need to elect leaders willing not only to implement a Green New Deal but also to restore the blue in our red, white and blue. **ST**

)) Waves to Water Prize for Desalination Tech. The Water Power Technologies Office (WPTO) at the U.S. Department of Energy (DOE) has announced a $2.5 million prize competition, Waves to Water (americanmadechallenges.org/wavestowater), to spur innovation in wave energy-powered desalination systems. It is the first prize under the Water Security Grand Challenge, a White House-initiated, DOE-led framework to advance transformational technology and innovation to meet the global need for safe, secure and affordable water. The prize seeks to accelerate technology development through contests to demonstrate small, modular, cost-competitive desalination systems. It will draw upon U.S. entrepreneurs, technologists, hardware developers and investors to harness the power of the ocean to provide potable water to remote coastal and island communities worldwide. Through four phases, the prize seeks to accomplish three goals: capture and evaluate business cases and concepts for small-scale modular wave power desalination; demonstrate desalination and marine renewable energy integration; and validate technologies in a field test setting that meet quantifiable benchmarks for freshwater production, ease of installation, cost and reliability/survivability.

)) DMX Carbon Capture, Storage Project. A consortium of 11 European stakeholders is launching the DMX project to demonstrate an innovative process for capturing CO_2 from industrial activities. It is part of a more comprehensive study dedicated to the development of the future European Dunkirk North Sea capture and storage cluster. The "3D" project (DMX Demonstration in Dunkirk) is part of Horizon 2020, the European Union's research and innovation program. Coordinated by IFP Energies nouvelles (IFPEN), the project brings together partners from research and industry from six European countries: ArcelorMittal, Axens, Total, ACP, Brevik Engineering, CMI, DTU, Gassco, RWTH and Uetikon. The objectives are: to demonstrate the effectiveness of the DMX process on a pilot industrial scale; prepare the implementation of a first industrial unit at the ArcelorMittal site in Dunkirk, which could be operational starting 2025; and design the future European Dunkirk North Sea cluster, which should be able to capture, pack, transport and store 10 million metric tons of CO_2 a year and should be operational by 2035. The project aims to help the world meet the targets of the Paris Agreement on global warming.

)) Winner of Shell Ocean Discovery XPRIZE. The GEBCO-Nippon Foundation Alumni Team has won the Shell Ocean Discovery XPRIZE, claiming the top prize of $4 million. The team includes 16 alumni of the Nippon Foun-



dation-GEBCO Postgraduate Training Program at the University of New Hampshire (UNH). Their entry into the competition was funded by the Nippon Foundation and utilized the SEA-KIT USV Maxlimer, alongside the Kongsberg Maritime HUGIN AUV. The HUGIN is rated to 4,500-m depth, and the SEA-KIT USV can autonomously launch and recover the AUV and acts as a communication link during subsea survey operations. The team mapped 278 km^2 and produced 10 high-resolution images. Additionally, eight 3D surfaces of the seafloor were produced using Fledermaus software. Kongsberg EM 304 multibeam data were uploaded online, and team members at UNH cleaned and produced nine point cloud images using Qimera. The prize money will be reinvested by the Nippon Foundation into the development of future ocean-mapping initiatives. The Nippon Foundation-GEBCO Seabed 2030 Project aims to map the entirety of the world's oceans.

)) Maritime Drive for Sustainable Financing Principles. Eleven major shipping banks, supported by industry partners, will launch the pioneering Poseidon Principles to integrate climate considerations into lending decisions in line with the International Maritime Organization's Greenhouse Gas (GHG) strategy. Poseidon Principles will give owners and operators more opportunity and freedom to explore different technologies and projects to decarbonize, knowing there will be financial incentives to support their success. As a global framework, the principles will establish a common baseline to quantitatively assess and disclose whether financial institutions' lending portfolios are in line with adopted climate goals. The 11 founding signatories represent a bank loan portfolio of approximately $100 billion and around 20 percent of global ship finance.

)) Walter Munk's Legacy Honored in Annual Award. The Marine Technology Society and the Walter Munk Foundation for the Oceans have established the Walter Munk Scholar Award to honor Munk's legacy of daring exploration and discovery through ocean science and technology research and his dedication to ocean education and conservation. Munk's seminal work in wave forecasting was instrumental in planning the Allied Forces invasion of Normandy (D-Day) that hastened the end of World War II. The award will be presented annually to a scholar in an undergraduate, graduate or postdoctoral program in ocean science, technology, exploration or conservation. Alfredo Giron won the inaugural award and gave a lecture on "The Risk of Oversimplification in Fisheries Management," the first in the annual Commemorative Walter Munk Scholar Lecture Series, to be presented by the award recipient. **ST**

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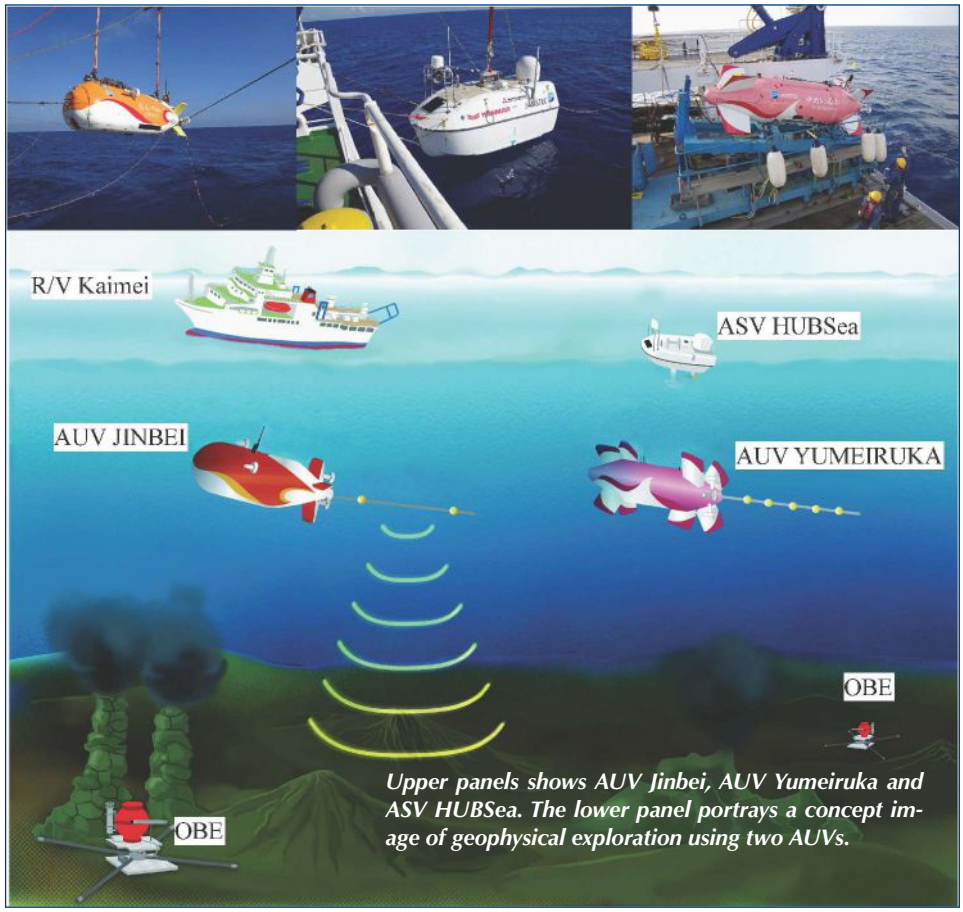
New Geophysical Survey Style

Using AUV-ASV Combo to Find Hydrothermal Sulfide Deposits

By Dr. Takafumi Kasaya • Dr. Tadahiro Hyakudome • Dr. Hisanori Iwamoto

Geophysical survey technique based on electromagnetic methods is generally used to estimate the potential quantity of land-based metallic ore deposits because of their electrical characteristics. To explore the potential of hydrothermal deposits in marine environments, DC resistivity surveys and electromagnetic surveys are extremely effective as geophysical exploration tools.

For Japan's recent marine natural resources requirements, the Zipangu in the Ocean program was started as a Strategic Innovation Promotion Program (SIP) managed by the cabinet office of Japan's government for the scientific and technological development of national natural resources. The Japan Agency for Marine-Earth Science and Technology (JAMSTEC) manages this project.

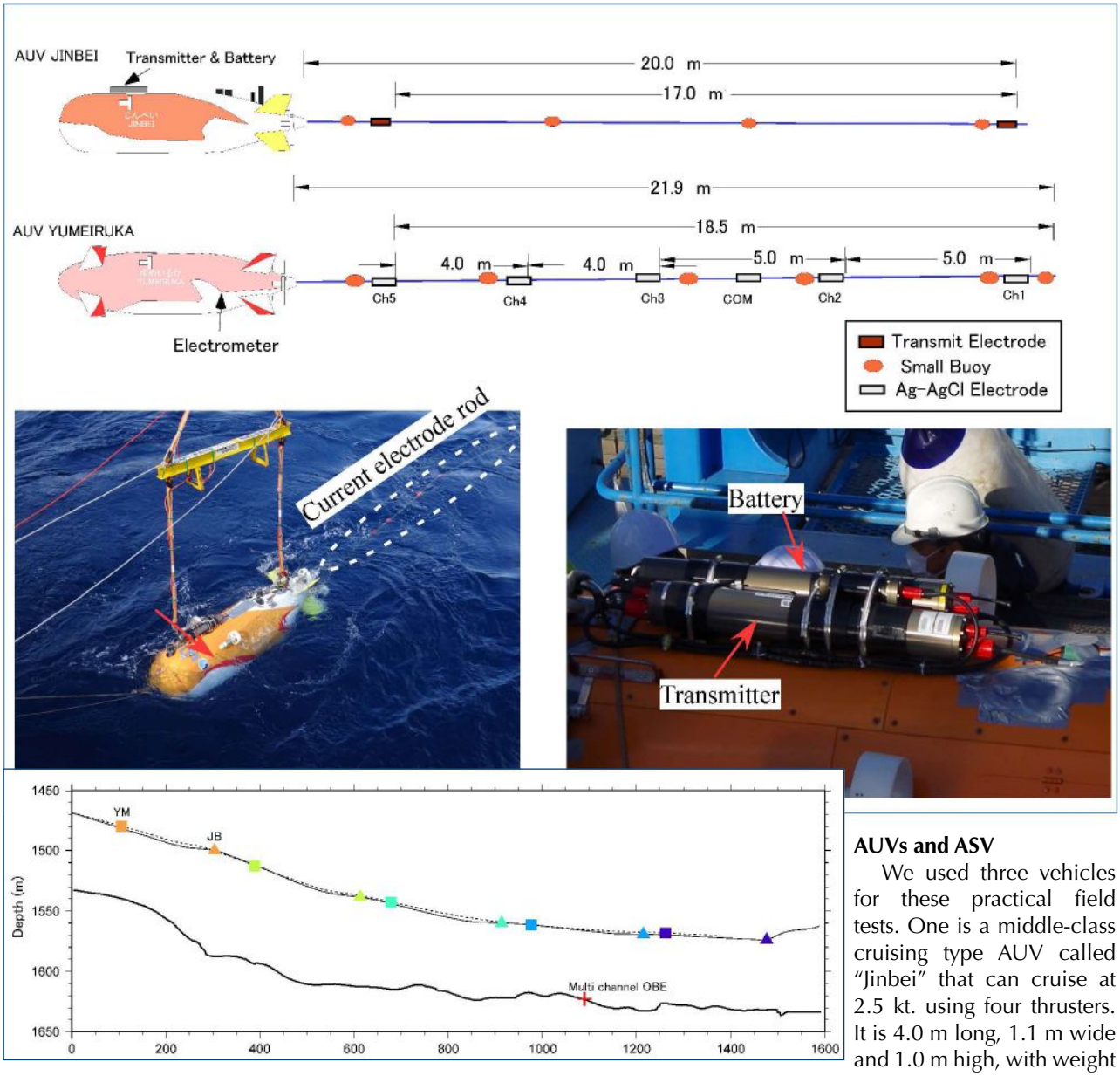


Upper panels shows AUV Jinbei, AUV Yumeiruka and ASV HUBSea. The lower panel portrays a concept image of geophysical exploration using two AUVs.

Resistivity is generally an important parameter for metallic ore deposits. Recently, detection of negative self-potential anomalies has yielded important data for the exploration of hydrothermal deposits. Our research group under this SIP project has developed instruments; obtained abundant field data, including self-potential anomaly in hydrothermal deposit areas; and studied the relation between hydrothermal deposits and the subsurface structure.

Our developed instruments are based on electrical current transmitted to seawater and electrical potential observation. Thereby, one can deduce both self-potential and resistivity data based on knowledge of an active source. This is extremely beneficial for hydrothermal deposit surveys.

AUVs, particularly because of their stable posture control without a towing cable, are powerful platforms



(Top) Upper panel shows the electrode and towed rod configuration of each AUV. Photographs of the lower panel show Jinbei before launching, with the current rod and instruments on the foretop of the vehicle. (Bottom) Vehicle tracks with bathymetry on the main survey line of the third dive. Triangles and squares respectively represent the positions of Jinbei and Yumeiruka reported every 5 min. Same-color symbols show reported positions at the same time. The thin line and dashed line respectively represent Jinbei and Yumeiruka tracks found by acoustic positioning.

for scientific investigations and industrial work, including hydrothermal deposit exploration under the seafloor. Therefore, to pursue more efficient survey techniques, we have conducted field tests using two AUVs, each with a transmitter and receiver optimized for an AUV, and an ASV to monitor the AUVs' condition in a hydrothermal deposit area.

AUVs and ASV

We used three vehicles for these practical field tests. One is a middle-class cruising type AUV called "Jinbei" that can cruise at 2.5 kt. using four thrusters. It is 4.0 m long, 1.1 m wide and 1.0 m high, with weight in air of 1.7 tons. The second AUV is "Yumeiruka," which is 5.0 m long, 1.2 m wide and 1.2 m high, with weight in air of 2.7 tons. Its maximum working depth and cruising speed are, respectively, 3,000 m and 2.5 kt. These vehicles were designed as multipurpose, on which various scientific instruments can be loaded. Their special features are characterized by their X rudder system. The Jinbei has that rudder in its rear, and Yumeiruka has two X rudders at the front and rear. An ASV called "HUBSea" was used to monitor and control the AUVs. It is 4.4 m long, 1.9 m wide and 1.8 m high, weighing 1.8 tons. This vehicle can cruise at 3 kt., with maximum speed of 5 kt.

Current Transmitter, Electrometer

Our original transmitter-and-receiver system was designed for the Marine DC Resistivity Survey (MDCR) and Controlled Source Electro-Magnetic Survey (CSEM) using a deep-tow system. We developed a new and improved small transmitter-and-receiver system for AUV operation based on the original system because of payload size and

weight limitations in water. Finally, all electrical devices were installed in a pressure case of small diameter.

The Insulated Gate Bipolar Transistor (IGBT) was used as the current transmitting control and switching device. It can record transmitted data with a 250-kHz sampling rate. The receiver unit can record five-channel electric fields with a 24-bit A/D converter. Its sampling rate is 1 kHz. Both units have an atomic clock for high-accuracy synchronization between a transmitter and receiver. For these expeditions, a transmitter and battery unit was loaded on the foretop of Jinbei. A 20-m-long transmitting electrode rod made with fiberglass was towed from the tail of the vehicle. The electrometer pressure case, including a battery, was installed in Yumeiruka and was also towed in a 22-m-long Ag–AgCl electrode array.

AUVs, ASV Operation Procedure

The pre-cruise check for each vehicle started before sunrise. After sunrise, the ASV was launched first because the research vessel is unable to monitor an AUV while another AUV is being launched. Then, Yumeiruka was launched and automatically dove to the target depth of 1,450 m, where it waited for Jinbei to dive to equal depth. Jinbei was launched last.

Each vehicle descended to the target depth in a spiral because the diving point is near the starting point of the survey line. After Jinbei arrived at the target depth, survey cruising began. Jinbei towed an approximately 20-m-long rod with two transmit electrodes. RV *Kaimei* followed Jinbei. Yumeiruka towed an approximately 20-m-long rod with six electrodes, including a common electrode.

The ASV followed Yumeiruka. The ASV has two cruising modes: scenario and automatic AUV tracking. With scenario cruising, the ASV follows a preinstalled survey line that is the same as that of Yumeiruka. For AUV tracking, the ASV follows the AUV while maintaining some distance in which it can communicate via acoustic telemetry. If the ASV approaches the AUV in horizontal distance, then the ASV slows its speed. If the ASV moves away from the AUV in horizontal distance, then the ASV speeds up automatically to maintain a set distance from the AUV. If the ASV overtakes the AUV, then the ASV speeds up and executes a U-turn, then moves behind the AUV and catches up with it.

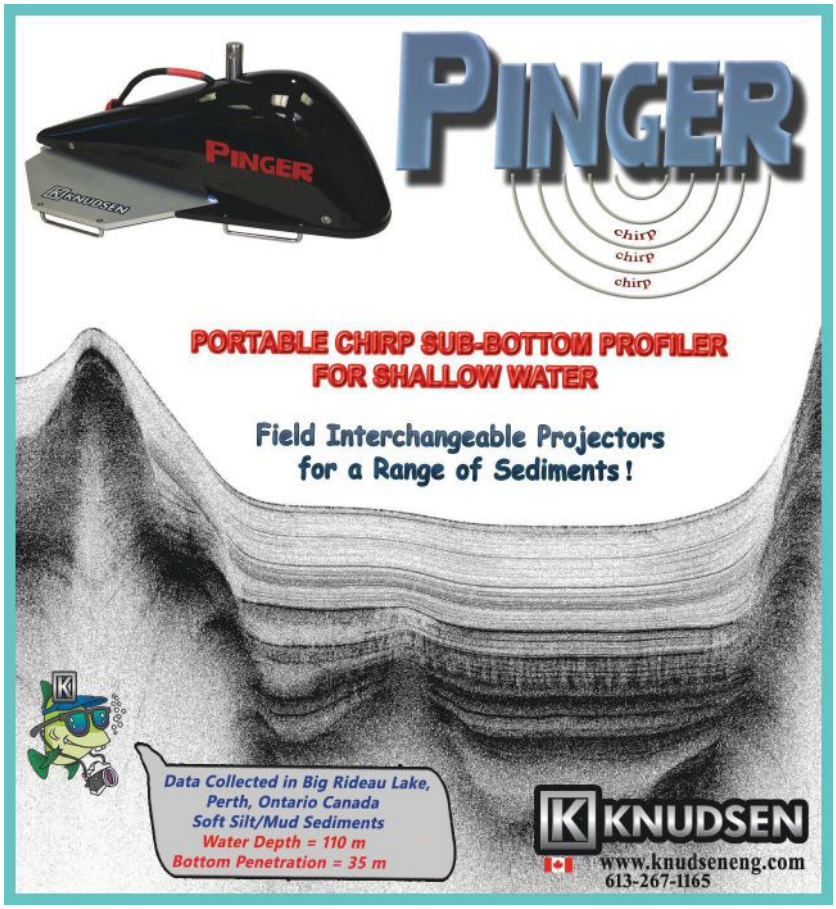
The status information of the ASV and Yumeiruka was sent from the ASV to RV *Kaimei* using wireless LAN, satellite communication and public BB (VHF). To check all status and positions of vehicles on each monitor screen, we strove to maintain a distance between the AUVs of 250 to 300 m. To maintain the distance, the cruising speed of each vehicle was controlled at 2 to 2.8 kt. using an acoustic control signal transmission from RV *Kaimei*.

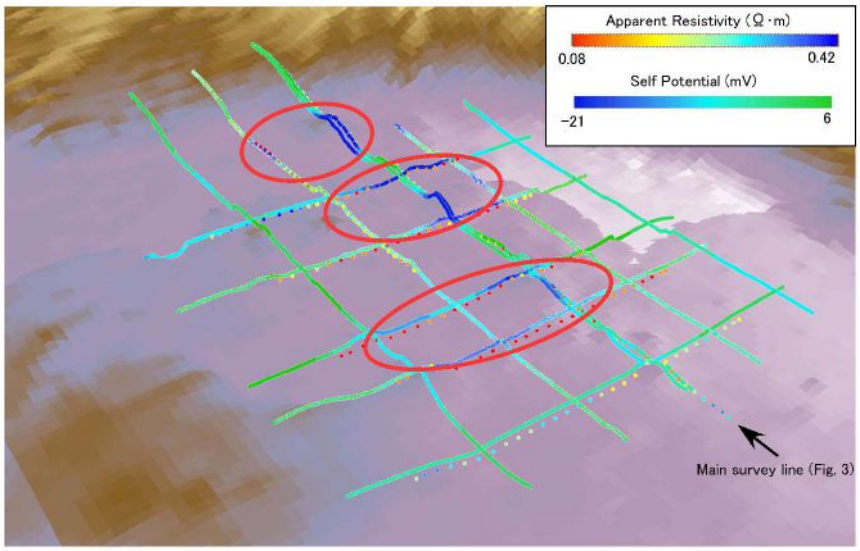
Data Processing and Preliminary Results

We conducted three practical dives in two hydrothermal deposit areas of the middle Okinawa Trough from April 28 to 30, 2018 on a scientific cruise to assess hydrothermal deposits (KM-18-04C).

Before the dives in both areas, we installed ocean-bottom electrometers (OBEs) to test long-range signal detection for MDCR surveys and CSEM surveys. The observed data are a time series of the electric potential, discharged electric current, and two AUV positions and altitudes along the dive track.

The electric potential receiving unit consists of each electrode related to a common electrode towed by Yumeiruka (4- and 5-m sensor distance). The electric current transmission unit consists of a pair of current electrodes towed by Jinbei, which has 17-m dipole length. The electric potential data are mixed with a low-frequency self-potential (SP) component and a controlled MDCR rectangle wave. The MDCR rectangle wave is consistent with 2-s positive transmit, 2-s suspend, 2-s negative transmit and 14-s suspend. For SP data processing, we apply a low-pass filter to the electric





Data plot of preliminary results, apparent resistivity and SP anomaly, with color-rough bathymetric image. Small-colored dots and colored lines respectively show the apparent resistivity and SP anomaly.

potential data (a 40-s length Gaussian filter) and drop the MDCR signal. Then, we apply a high-pass filter (a 1,200-s length Gaussian filter) and remove long-period fluctuations from the survey line. Self-potential is calculated from the potential difference of 1 to 4 ch and is integrated by the Yumeiruka track.

We were able to control the distance of each vehicle. As demonstrated, Yumeiruka followed the fore position of Jinbei.

For MDCR data processing, the AUV position (latitude, longitude and depth) data are recorded using an acoustic navigation system (ANS). These position data are smoothed and resampled as follows: eliminate position outliers, then filter and resample to produce 1-s time series; define survey lines while two vehicles are on the planed survey lines simultaneously; divide the data (position and electric potential) for each survey line; split the electric potential data for every MDCR discharge cycle; combine transmit and electric potential data based on time stamp; remove the potential difference fluctuation attributable to spike noise and electrode fluctuation caused by AUV towing; calculate the resistance value (V/I), except for immediately after start and end of power transmission, where chargeability effect is apparent; calculate the apparent resistivity (1 to 3 ch, 3 to 5 ch) from the distance separating the two vehicles and the transmit and potential electrode arrangement; and, after excluding outliers, average the apparent resistivity of 1 to 3, 3 to 5 ch, eliminating apparent resistivity points with great distance between the two AUVs (300 m or more).

Conclusion

We successfully conducted an MDCR survey and self-potential survey simultaneously using two AUVs and an ASV in two hydrothermal areas. Preliminary results demonstrate that we were able to detect obvious anomaly areas indicating hydrothermal deposits using two independent parameters: low apparent resistivity and negative SP anomaly. The transmitted signals were also recorded by OBEs installed on the seafloor. This survey method will allow us to estimate the amount of a deposit in the near future.

We were able to cover an area of about 1 sq. km with only 4 hr. of observation time near the seafloor. It is also a point of advancement that AUVs can enter the next survey line after completing a survey line with only 3 to 5 min. gap. In contrast, using the deep-tow method results in very long shift time between survey lines; it takes more than 1 hr. in cases of over 200-m-cable towing in the deep sea. An AUV can move at more than 2 kt. during survey, demonstrating that geophysical exploration survey using AUVs is extremely efficient.

While we took 4 to 5 hr. of observation time near the seafloor, it will be possible to cover an area of more than several square kilometers by overnight observation if the battery life and capacity were improved. At the present stage, an operator must direct all controls to maintain the safe, planned distance between the two AUVs. However, if such control could be automated using AI, more efficient observation is possible. **ST**

Dr. Takafumi Kasaya, a senior research scientist with the Japan Agency for Marine–Earth Science and Technology (JAMSTEC), conducts research in exploration geophysics around hydrothermal deposit areas and subduction zones. He also develops various survey instruments.

Dr. Tadahiro Hyakudome is an engineer for underwater robotics research and development with JAMSTEC. His research interests include autonomous underwater vehicles, autonomous surface vehicles and development of power sources such as fuel cells and batteries.

Dr. Hisanori Iwamoto is a project engineer for JAMSTEC's team on the development of new-generation research protocols for submarine resources. He conducts geophysical surveys using electromagnetic and gravity methods.

TOTAL OCEAN MARKET COVERAGE 2019

JANUARY
Annual Review & Forecast / Buyers Guide/Directory
**Oceanology International Americas,* February 25-27, San Diego, CA

FEBRUARY
Instrumentation: Measurement, Processing & Analysis
***U.S. HYDRO 2019,* March 18-21, Biloxi, MS
***Ocean Business,* April 9-11, Southampton, U.K.

MARCH
Electronic Charting/Vessel Management/Ports & Harbors/Dredging/Homeland Security
***AUVSI XPONENTIAL 2019,* April 29-May 2, Chicago, IL

APRIL
Offshore Technology/Alternative Energy & Ocean Engineering
***Offshore Technology Conference,* May 6-9, Houston, TX
***UDT 2019,* May 13-15, Stockholm, Sweden

MAY
Communications, Telemetry, Data Processing
***BlueTech Expo,* June 4-5, Washington, DC
***Oceans '19 MTS/IEEE Marseille,* June 17-20, Marseille, France
***CLEAN PACIFIC 2019,* June 18-20, Vancouver, Canada

JUNE
Seafloor Mapping/Sonar Systems/Vessels

JULY
Deck Gear, Cable, Connectors, Power Systems & Salvage

AUGUST
Geophysical Exploration/Seafloor Engineering
***SEG 2019,* September 15-20, San Antonio, TX
***OceanObs'19,* September 16-20, Honolulu, HI

SEPTEMBER
Ocean Resources Development & Coastal Zone Management
***Offshore Energy 2019,* October 7-9, Amsterdam, The Netherlands
***CLEAN GULF 2019,* October 28-30, New Orleans, LA
***OCEANS 2019 Seattle,* October 28-31, Seattle, WA

OCTOBER
Environmental Monitoring, Remote Sensing & Pollution Control
***International Water Conference,* November 10-14, Orlando, FL

NOVEMBER
Undersea Defense/Antisubmarine Warfare
***International WorkBoat Show,* December 4-6, New Orleans, LA

DECEMBER
Diving, Underwater Vehicles & Imaging
***Underwater Intervention 2020,* February 4-6, New Orleans, LA
***EUROMARITIME 2020,* February 4-6, Marseille, France

**EXTRA SHOW DISTRIBUTION (additional shows will be added as information is obtained)

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1963 - 2019 Celebrating More Than 56 Years of Serving the Global Ocean Community

OCEANS 2019 Seattle

From October 27 to 31, leading marine professionals from all over the world will gather in Seattle, Washington, to participate in one of the foremost events focused on marine technology and engineering: the annual OCEANS Conference, sponsored by the Marine Technology Society (MTS) and the IEEE Oceanic Engineering Society (OES).

Representatives from the biggest names in the industry will be presenting and participating in the event, while suppliers developing cutting-edge technology will offer demonstrations, hands-on workshops and corporate presentations.

Show Theme, Topics

For the technical program, this year's theme is "Blue Sea, Blue Sky, Blue Tech." The program will explore new opportunities in the blue economy, including local and sustainable practices and Washington state's new maritime business plans and progress.

OCEANS will cover topics including: Underwater Acoustics and Acoustical Oceanography; Sonar Signal/Image Processing and Communication; Ocean Observing Platforms, Systems and Instrumentation; Remote Sensing; Ocean Data Visualization, Modeling and Information Management; Marine Environment, Oceanography and Meteorology; Optics, Imaging, Vision and E-M Systems; Marine Law, Policy, Management and Education; Offshore Structures and Technology; and Ocean Vehicles and Floating Structures.

Local topics will also be covered, including: Coordinated Multi-Vehicle Teams for Marine Applications (Air, Surface, Underwater); Polar and Under-Ice Stationary and Mobile Observing Systems; Offshore Earthquakes – Measuring and Mitigating Their Impact; Wave, Current, Wind and Gradient Energy Harvesting; Best Practices in Sensor Design and Use, Systems Operations, and Data Management; Plastics in the Ocean: Observation and Mitigation Methods; Aquaculture: Technology for Man-

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"For the technical program, this year's theme is 'Blue Sea, Blue Sky, Blue Tech.'"

agement, Monitoring and Mitigation; and Electrification of Marine Propulsion Systems and Digitalization of Marine Handling Systems.

Highlights

This year will feature the inaugural Start-Up Pavilion, providing an opportunity for new and emerging companies to experience the most productive conference in the industry during the most important phase of your company's growth. Positions for the Start-Up Pavilion are limited and will be sold on a first-come, first-served basis. You can fill out the form on the OCEANS 2019 Seattle website at seattle19.oceansconference.org to see if you qualify.

In addition, there are plenty of exciting opportunities for students and young professionals to connect with a thousand international leaders in academic, private and governmental ocean research and instrument design at the conference.

Location

Seattle, Washington, is the perfect backdrop for 2019's groundbreaking OCEANS Conference. This progressive, oceanfront city serves as the headquarters of NOAA's Pacific Marine Environmental Laboratory, a federal laboratory that makes critical observations and conducts cutting-edge research to advance our knowledge of the global ocean and its interactions with the earth, atmosphere, ecosystems and climate. With Seattle's maritime industry bringing in nearly $38 billion into the state's economy, this location will enhance every aspect of the OCEANS Conference.

While you're there, make a visit to the Space Needle, Pike Place Market and/or the Seattle Aquarium. There's something for everyone to enjoy in Seattle.

OCEANS Ambassador Program

The best way to experience OCEANS 2019 Seattle is with your entire network by your side. If you are interested in becoming an OCEANS Ambassador for the chance at a discounted registration rate, please fill out the form at seattle19.oceansconference.org. **ST**

Unified Subsea Service Provider

Single-Source Operational Umbrella Yields Economic Benefits

By David Sheetz

Delivering efficiencies is critical in a market where the oil price is down and operating costs are high. The dynamic within the industry has changed, so finding ways to deliver services more quickly and efficiently is not just desirable, it is indispensable.

Founded as Edison Chouest Boat Rental in Galliano, Louisiana, in 1960, Edison Chouest Offshore (ECO) is now recognized globally for its diverse and dynamic marine transportation solutions and supports the majority of the U.S. Gulf of Mexico deepwater operations. ECO operates a growing fleet in excess of 200 vessels, ranging from 87 to more than 525 ft. in length, serving an expanding customer base around the world. ECO is able to design, build, own and operate diverse, high-capacity and technologically advanced vessels.

As a member of the ECO group of companies, C-Innovation partners with other ECO companies to harness the resources of a large vessel fleet, shipyards, port facilities, and logistics and communications services, ultimately offering a complete, economical solution under one operating umbrella.

With corporate headquarters in Mandeville, Louisiana, C-Innovation's advanced ROV capabilities provide a broad spectrum of support to subsea construction projects, as well as drilling, intervention, maintenance and heavy-lift assignments. It stands to reason that by engaging a workforce with a diverse set of skills, oil and gas operators can ensure a more turnkey approach to managing their business. Since many of the larger projects require several subcontractors to manage, attempting to ensure each of them is aligned to the end-goal can be a challenge at times, especially with constantly changing time lines and schedules.

By combining project management, engineering, procurement, service and personnel into a single-source contract, more inclusive offerings can be obtained at the same price structures, securing long-term, more predictable profitability. By uniting services and offering complete packages to the end-user, a single contractor can maintain a higher utilization rate, enabling projects to be completed more efficiently than ever before. This one-stop-shop approach makes it much easier to identify and implement the best solutions to the wide array of complex problems that are often encountered offshore.

Deployment of one of C-Innovation's (C-I) UHD ROVs from Edison Chouest Offshore's (ECO) vessel **Timbalier Island**. *ECO is C-I's parent company.*

Complete Solutions for Subsea Projects

C-Innovation realized early on that the complexi-

ties in subsea projects need special attention, which led the company to form the turnkey Subsea Projects Group, with the sole purpose of dedicating project management and engineering to specific projects and clients.

Capable of providing a complete solution to its global customer base without sourcing outside the Chouest family worldwide, the group is based in ECO's Houston office, at the heart of the energy corridor. With the backing and support of the diverse family of companies within the ECO group, the vertical integration among the vast network of Chouest affiliate companies makes it possible to provide fully integrated subsea solutions for complex projects.

An in-house project management team provides engineering support, procedure development and review, project execution and final reporting requirements. With access to ECO's inventory of mission-specific vessels, it provides greater flexibility in matching and scheduling of assets.

The diverse group of companies also includes Chouest's various port facilities, a logistics company, tank-cleaning services, shipyards and drydocks, located throughout the U.S. Gulf Coast and Brazil.

The Benefits of a Broad Perspective

With the collective experience of the ECO group of companies, C-Innovation is provided with visibility to many different sectors of the market. Trends in specific areas of business can easily be identified and can be used to inform adjustments in other sectors of the business.

One of C-Innovation's affiliate companies is C-Logistics, which works directly with operators to plan and manage schedules on the majority of large-scale offshore projects. Projects of this size often need to be planned months in advance. C-Logistics aims to work hand-in-hand to deliver the most economic plans, and C-Innovation in turn works with C-Logistics to deliver a more efficient product to the client.

It is clear that the ability to respond to a client with a full solution, operating as a single point of contact, reduces the cost to the client and also reduces the risks by dealing with a single subcontractor. By adopting this large-scale, single-solution approach, workscopes such as tree installations, hydrate remediation, survey operations, and inspection, maintenance and repair (IMR), which used to take up to a year to plan, can be achieved in less than a month. Engineering, design and project management along with execution and follow-up are all carried out internally on C-Innovation's vessels, in port facilities and by C-Innovation's personnel.

The Unique Adaptability of an Integrated Approach

One recent example of the benefits of using a single-source service provider involves a large international operator in the Mississippi Canyon area in the Gulf of Mexico that invited C-Innovation to complete a flowline ashpaltene remediation job. The main objective was to clear a flowline of an extensive ashpaltene blockage to satisfy the government's decommissioning requirements. Project management, engineering, offshore management, logistics and client relations interface was provided by C-Innovation's Subsea Projects Group. The crew and associated personnel successfully achieved a task previously thought to be impossible: lifting a pipeline off the seabed, threading it through the moonpool of a vessel and supporting it for weeks while a surface intervention was carried out. The client is now sole-sourcing a phase-two solution through C-Innovation to continue to complete the workscope safely and without impact to the environment.

In another example of client benefits from using a sole service provider, a large international operating company in the Gulf of Mexico asked C-Innovation to open an FS2 fluid-loss isolation-barrier valve using ROV power only. The drilling and completion rig had already moved off site, therefore a high cost and even higher impact to the remaining drilling and completion schedule would have been incurred to bring it back just to actuate the valve in question. Ultimately, C-Innovation designed, built and deployed a subsea tree controls interface system, which leverages the existing infrastructure and technology of the ROV systems. Estimated cost savings were $3 million per well when compared to accomplishing the same with a rig and riser. The client considered the procedure to be a huge success and a long-term solution to an otherwise expensive endeavor.

Conclusion

The main economic benefit from using a single-source methodology comes from the efficiencies realized in the planning and execution of projects. Most recently, C-Innovation secured a three-year contract with the largest energy investor in the deepwater Gulf of Mexico. The contract encompasses subsea construction, IMR and logistics services. With Port Fourchon, Louisiana, serving as the homeport, the new contract will bring together ECO's extensive fleet of multipurpose platform supply and well-intervention vessels with C-Innovation's ROV, tooling, project management and engineering services. The scope of work includes: jumper installations; subsea tree installations; facility underwater inspections in lieu of drydocking; commissioning of new assets; and general field support.

C-Innovation has also signed a two-year master services agreement with call-off options with a major operator for IMR services for the MV *Island Enforcer*, a 401-ft. subsea installation and construction vessel. The vessel was delivered in 2010 from the Bergen Group in Norway to Island Offshore, a joint venture between the Ulstein family of Norway and the Chouest family of Louisiana. The agreement is an all-inclusive contract including vessel, ROV, survey, engineering and project management. Initial work is underway with the installation of two production jumpers and EFLs at BP's Atlantis field at 6,500-ft. depth. **ST**

David Sheetz is the manager of the Subsea Group for C-Innovation, an affiliate of Edison Chouest Offshore (ECO). Based in Houston, Sheetz oversees all subsea activities, including project management and engineering; construction and IMR; and drilling support, cutting and well services. Sheetz has nearly 30 years of subsea services experience in the oil and gas industry.

SEG19

The Society of Exploration Geophysicists 2019 International Exposition and 89th Annual Meeting in San Antonio, Texas, from September 15 to 20 will feature cutting-edge technologies ranging from machine learning and full waveform inversion to near surface and environment, and all areas of interest in between. Attendees will explore tight rocks and unconventionals in hot plays and also have a look at deepwater and conventionals, striking a good balance between land and marine technical topics.

Technical Program

One of the meeting's hottest topics this year is Machine Learning and Data Analytics (MLDA), which comprises six oral sessions, eight poster sessions and a special session. Within the MLDA sessions are several subtopics, including interpretation, processing and inversion. In this era of digital transformation, the Machine Learning theme is also pertinent to interpretation, near surface and reservoir characterization.

The program includes sessions on geomechanics and fracturing, novel acquisition methodologies such as distributed acoustic sensing, drones, and passive and electromagnetic methods—all applied to new and challenging hot plays, including the Permian and other tight rock plays, Latin America and deepwater. The unconventional emphasis driving many of the technical topics covers seismicity, distributed acoustic sensing, shear waves, land acquisition, microseismic, geomechanics, passive seismic and fracture characterization.

Attendees can earn continuing education units the weekend prior to the Annual Meeting with courses by experts including Jim Gaiser, Ian Jones, Kurt Marfurt, Osman Hassan and more. The 20 post-convention workshops on Thursday and a half-day on Friday feature a wide range of technical topics, including several with a digital and tight-rock theme.

Business of Applied Geophysics Sessions

SEG will bring back a series of Business of Applied Geophysics (BAG) plenary sessions (included in your delegate registration) focused on the business impact of applied geophysics for the oil and gas industry. Separate from the technical sessions and workshops, these plenary sessions bring together leaders from operating companies, governments, service providers, educators and consultants who will discuss the business opportunities and challenges of the economic application of geophysics in the oil and gas business.

BAG Sessions include: Challenges and Solutions in Developing Resource Plays; Putting Diversity to Work; Digital Transformation in Petroleum Geophysics—What Impacts Are We Seeing?; Latin America and the Caribbean: Business Opportunities and Challenges; Improving the Business Model of Land Seismic and Processing in the U.S.: Technology Quality, Economics; and the Changing Business Climate of Marine Geophysics: Roadmap to the Future. You can find out more about the BAG plenary sessions at seg.org/am/bags.

Social Events

The golf tournament and Presidential Jam music party are back. There will also be field trips and tours, including the Spanish Missions, Natural Bridge Caverns, Cave Without a Name, kayaking on the San Antonio River and more, which you can sign up for when you register.

Event App

Stay connected at SEG19 with real-time updates and easy-to-navigate features on the SEG Events Mobile App. You can bookmark sessions, rate technical program presentations, search for speakers, build your schedule and more on the app. Using the app is the best way to get the most out of the Annual Meeting. Search "SEG Events" and download from Google Play or the Apple App Store. If you downloaded the SEG Events App for a previous meeting, you can add SEG19 by navigating to the "Settings" menu and choosing "Load Another Meeting." The app is available for iPhone/iPad, Android and Blackberry.

Visit seg.org/am for more information and to register for SEG19. **ST**

Platform and Project in Concert

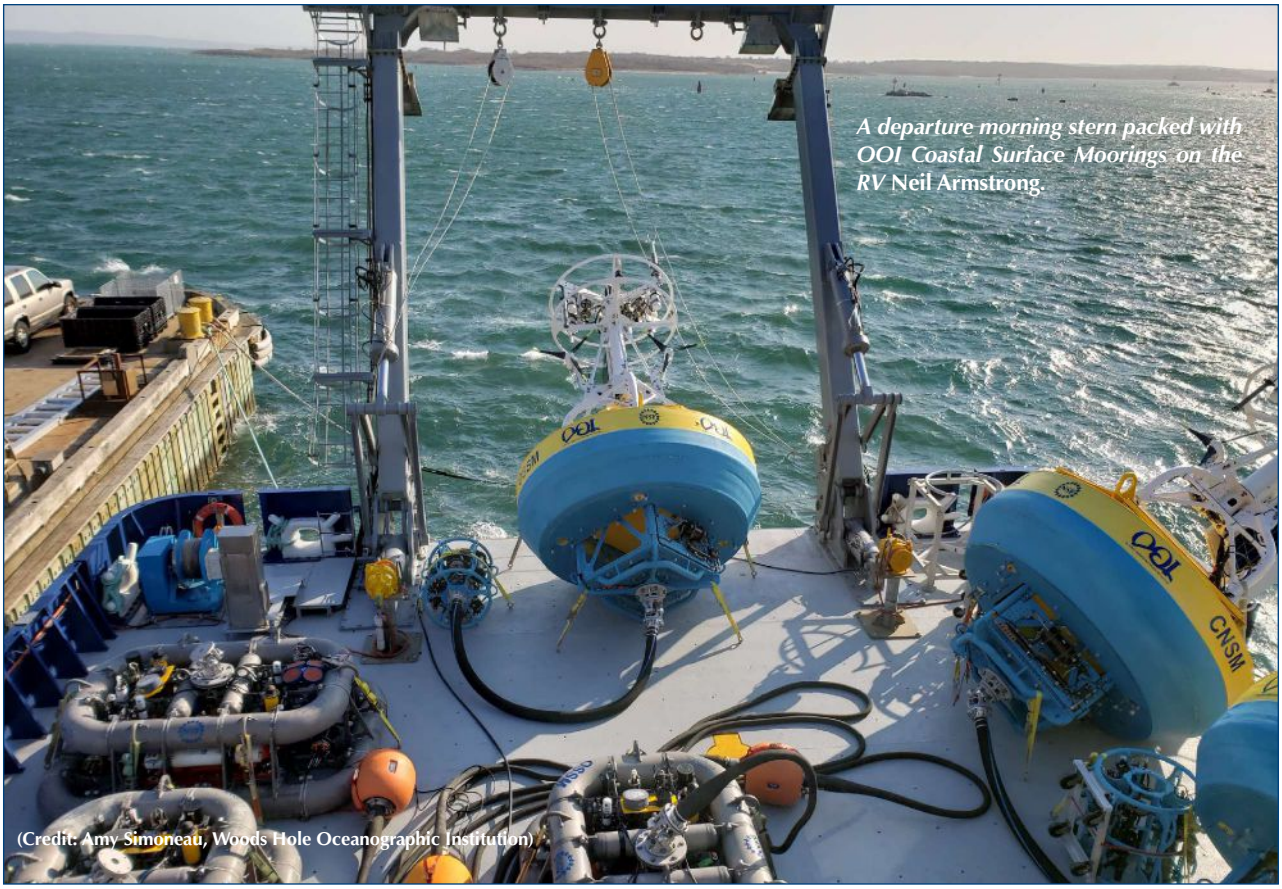
RV Neil Armstrong *Supports Ocean Observatories Initiative*

By Amy Simoneau

The National Science Foundation (NSF) funded Ocean Observatories Initiative (OOI) is an integrated infrastructure program of platforms and sensor systems measuring physical, chemical, geological and biological properties and processes from the seafloor to the sea surface at sites in the coastal, regional and global ocean. The OOI network was designed to address critical science-driven questions for better understanding and management of our oceans by enhancing our capabilities to observe and address key issues such as ecosystem variability, ocean acidification, climate change, carbon cycling, underwater volcanism, water column processes, coastal upwelling, and air-sea fluxes of heat, moisture and momentum. The OOI infrastructure was deployed in 2013 and now has well-established arrays providing a sustained observational presence in the ocean.

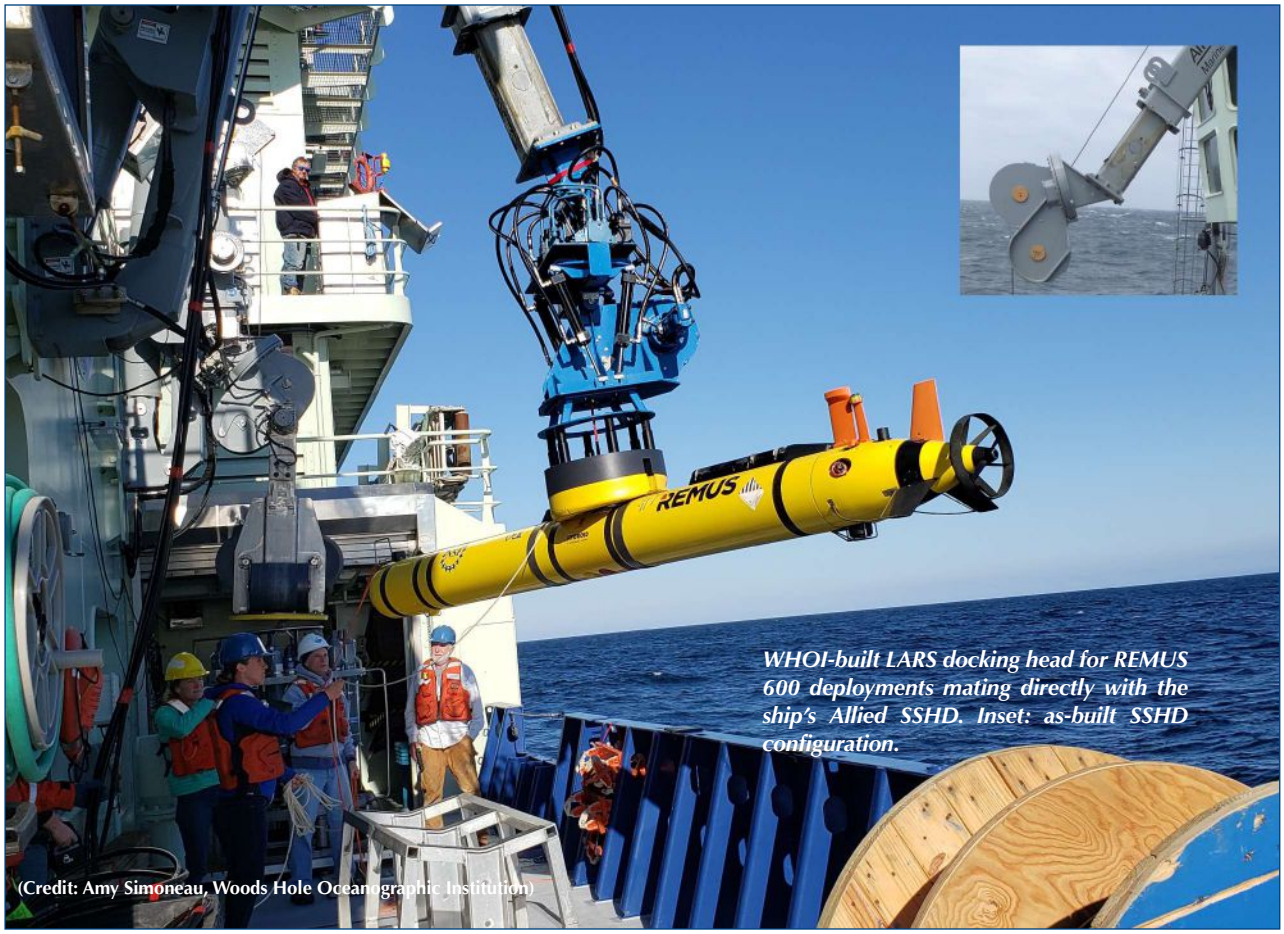
The Project

The Coastal Pioneer Array is one of two coastal observatories among the OOI suite of global, coastal and ca-



A departure morning stern packed with OOI Coastal Surface Moorings on the RV Neil Armstrong.

(Credit: Amy Simoneau, Woods Hole Oceanographic Institution)



WHOI-built LARS docking head for REMUS 600 deployments mating directly with the ship's Allied SSHD. Inset: as-built SSHD configuration.

(Credit: Amy Simoneau, Woods Hole Oceanographic Institution)

bled arrays. Situated at the shelf break southeast of Long Island, the site is a natural to study mechanisms from the seafloor to the air-sea interface. To minimize the impact of these long-term installations, site planning included local fisheries and other marine users of the ops area. Further, as part of the permitting process, OOI has agreed to leave behind nothing on the seafloor, meaning anchors and all other equipment need to be recovered on each service cruise. The moorings deployed to meet these requirements are in-house designed and built products of the Applied Ocean Physics and Engineering (AOPE) and Mooring Operations and Engineering (MOE) groups at the Woods Hole Oceanographic Institution (WHOI).

The Platform

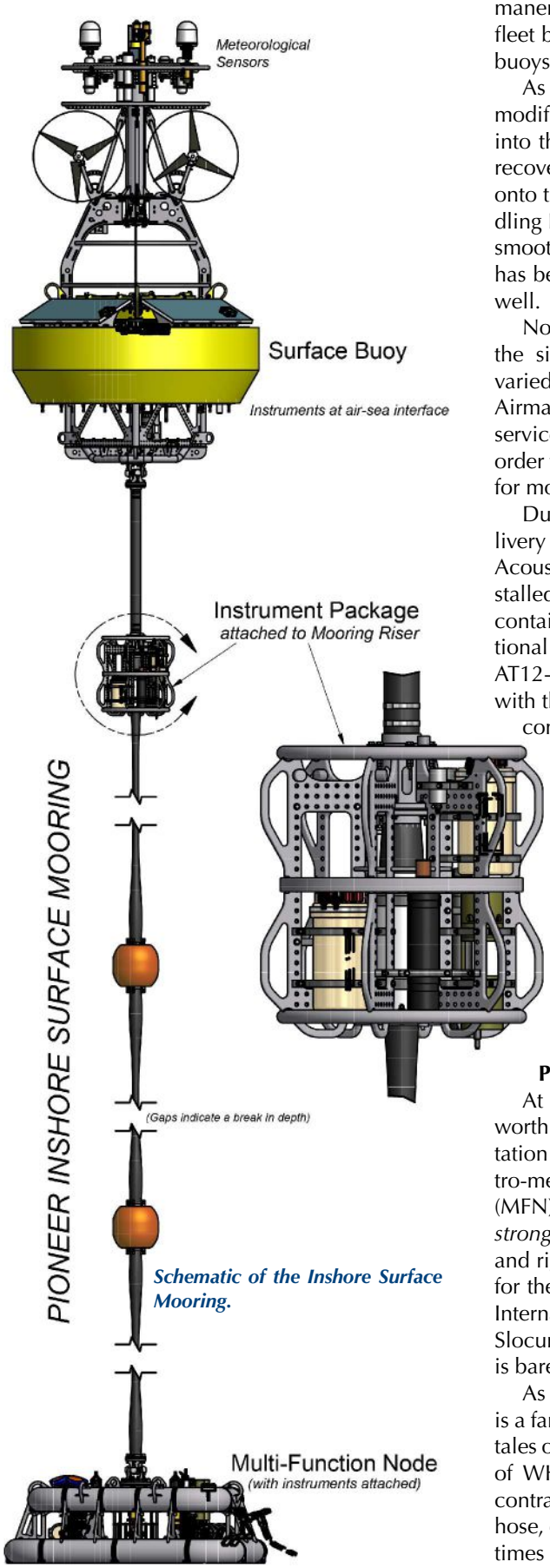
RV *Neil Armstrong* is one of the U.S. Navy's two new *Ocean*-class research vessels serving the oceanographic community from WHOI. The ship is picking up where the RV *Knorr*, now ARM *Río Tecolutla* of the Mexican Navy, left off after completing some of the earliest Coastal Pioneer Array cruises starting in 2013 with Pioneer 1. RV *Neil Armstrong* was built along with RV *Sally Ride* for the Office of Naval Research (ONR) by Dakota Creek Industries Inc. in Anacortes, Washington, and the vessels were subsequently transferred for operation under charter-party agreements with WHOI and Scripps Institution of Oceanography, respectively.

Armstrong's hull has been specially designed to divert data-destructive air bubbles from transducer faces while all engineering equipment is shock-mounted to keep machinery noise isolated from the acoustic instrumentation. The new ship has been customized since delivery and science outfitting. Affectionately referred to as a lively vessel, ballast and drainage arrangements have been optimized for a less wet and smoother ride. An enclosed sampling space and track system for the CTD rosette increase successful operations in higher sea states. These mods better equip the ship for its primary operating area in the North Atlantic. The diverse state-of-the-art acoustic instrumentation arrangement mounted in the hull is ready for prime-time science service.

The Concert

It's a six-year and dozen-expedition performance. Over these years, a well-oiled machine resulting from the partnership has emerged. The scientists, engineers and technicians servicing OOI's Pioneer site are regular visitors on the RV *Neil Armstrong*, where the ship's facilities and personnel are ready as these legs recur to meet the needs of the project.

Twice yearly on this vessel since 2016, and a loose handful of cruises aside from that, trips to Pioneer are an ideal evolution; familiar enough to hit a routine stride with enough new instrumentation rolled in to keep things interesting. Expectations are set. Patterns fall into place. There are stored .cmd files for selection and operating commands of three frequencies of Teledyne RD Instruments ADCP data collection with the University



Schematic of the Inshore Surface Mooring.

(Courtesy of OOI Coastal and Global Scale Nodes, Woods Hole Oceanographic Institution)

of Hawaii Data Acquisition System (UHDas). Semi-permanently mounted topsides are freewave, Wi-Fi and fleet broadband antennae to communicate with surface buoys and guide glider missions.

As the project progresses, there have been pointed modifications to accommodate OOI operations. A year into the ship's life, a Hydroid REMUS AUV launch and recovery system (LARS) was designed to bolt directly onto the ship's Allied Marine Crane Starboard Side Handling Device (SSHD) to safely dock vehicles, making for smooth evolution of AUV operations. The project's LARS has been pressed into service for glider deployments as well.

Nothing says transient like hanging a transducer over the side. *Armstrong* is equipped to serve customers' varied underwater communication needs. The 12-kHz Airmar CS229 transducer is regularly co-opted from its service to the ship's Knudsen Chirp 3260 echosounder in order to connect to EdgeTech's acoustic release deck box for mooring operations and survey.

During the ship's shipyard warranty a year after delivery to WHOI, a micromodem system built by WHOI's Acoustic Communications (ACOMMS) Group was installed in a spare scientific sea chest. The micromodem contains an array of four transducers: two Gavial International Transducer Corp. ITC-3013, one Teledyne Benthos AT12-A1, and one Teledyne Benthos AT18-A1. Together with the deck box, the system allows for unencumbered communication with AUVs and other assets requiring telemetry. The ship can be underway, maneuvering or conducting other deployments. On this year's cruise, one of the ITC-3013 transducers was wired directly for use with OOI's acoustic releases so that no piece of equipment was required to share.

When ROV tracking is on the mission docket, *Armstrong* is USBL-ready with a Sonardyne Ranger2 system, including the HPT 7000 transceiver head; a lowerable device mounted to a Kongsberg HiPAP pole with gate valve that can be deployed and withstand speeds of 10 kt.

Pioneer 12

At the WHOI pier in April 2019, three moorings worth of giant surface buoys, Near Surface Instrumentation Frames (NSIF), connecting EOM Offshore electro-mechanical stretch cable and Multi-Function Node (MFN) anchors were loaded onto the fantail of *Armstrong*. Multiple 20-ft. containers were loaded for storage and rigging along with a flat rack 200-amp. power pack for the Lantec heavy-lift winch. Also included are a TSE International Inc. spooling winch, Teledyne Webb G2 Slocum gliders and Hydroid REMUS 600 AUVs, so there is barely a spare square meter of deck space.

As moorings go, the Inshore Surface Mooring (ISSM) is a fancy one with a lot of neat technological toys telling tales of the dynamic coastal process system. An amalgam of WHOI engineering with commercial products and contracted forms, it is unique. The EOM Offshore stretch hose, developed and patented at WHOI, elongates to 1.5 times its starting length. Supplying power to the seafloor

"It's a six-year and dozen-expedition performance. Over these years, a well-oiled machine resulting from the partnership has emerged."

MFN, the stretch hose allows data to be passed from the MFN to the surface buoy and then to shore via satellite. Designed to rest at the depth of the water column in calm conditions, it is capable of withstanding movement from tidal cycles to hurricanes, all the while calmly communicating data from the MFN. The MFN contains a 6,000-lb. stainless steel anchor and recovery-line pack inside syntactic flotation, all contained in the center of an instrumentation frame. The MFN supports a full sensor suite at the seafloor, hunkered, learning. The instrumentation measures parameters from waterborne pCO_2 to spectral absorption to pH to bio-acoustics to water velocity to typical CTD measurements, along with pressure and oxygen staples. All of this from tip to tail is powered by and logged with WHOI-engineered control systems and data concentrators.

With this many assets in the water at any one time, there is bound to be the occasional fault in equipment. On the ISSM alone, there are 30-plus scientific instruments and loggers. This does not factor in the mechanical hardware infrastructure of the mooring in the form of solar panels, batteries, bolts, innumerable cables and connectors, EM stretch hoses, acoustic releases, etc.

During Pioneer 10 in early spring 2018, the ISSM surface buoy through to the MFN was recovered as planned, but a mechanical malfunction prevented the acoustic release from allowing the syntactic flotation to carry the anchor messenger line to the surface. Following the environmentalist edict of leave no trace, the spring 2019 expedition set to work in recovering the anchor.

By the time this year's first cruise came around, the ship's USBL system was prepped to take on a new ROV for mooring inspections and anchor recoveries. The slick new Sondaryne Nano transponder beacons enable navigation. Measuring in at 6 in. tall with a depth rating of 500 m, the connector-less charge and communication Nanos can be easily mounted on the vehicle and the recovery-line spool.

When previous ROV-based recovery operations were required, OOI contracted out with independent groups, including University of Connecticut for its Kraken2 ROV. However, due to a transition in operations model, this Kraken2 was unavailable for hire during the 2018 Pioneer season. Additionally, the setup occupies precious deck space in a gear-heavy evolution. After hiring out a SeaView Systems vehicle to witness its performance, OOI made the move to purchase its own Saab Seaeye Falcon DR ROV for in-house rapid-response use. The ver-

Surface buoy, mooring string and multi-function node ready for recovery in the morning fog at the OOI Pioneer Array.

(Credit: Rebecca Travis, Woods Hole Oceanographic Institution)

(Credit: Rebecca Travis, Woods Hole Oceanographic Institution)

Seaeye Falcon ROV seafloor footage of unrecovered anchor ready to be hooked.

satility in having a ready-to-go system is undeniable.

With video equipment scavenged from the ship's own collection of converters and a Crestron digital media switcher borrowed from the WHOI National Deep Submergence Facility's Jason group, command central commenced in the aft end of the main lab on the Seaeye Falcon's maiden voyage.

Camera and acquisition data video feeds were piped in to the switcher for ROV operations use and vehicle camera feeds piped out for the bridge and elsewhere via the ship's video matrix. The USBL system sends automated datagrams to the Kongsberg Dynamic Positioning system on the bridge.

All these elements enable situational awareness among all invested parties. The debut ROV dive had its expected shakedown set of trials and tribulations, with many notes taken; nevertheless, the proof of success is in the anchor on deck.

K-Sync Concerto in EK80

During the overnights when darkness and sleep schedules prohibit continued mooring operations, another NSF-funded project makes use of the down time.

The Northeast U.S. Shelf (NES) Long-Term Ecological Research (LTER) project ties in nicely with OOI's goals: Some nights that project conducts CTD transects, and some nights it does ADCP and Simrad EK80 wide-band transceiver biomass surveys, the overlapping frequency interference minimized with a Kongsberg K-Sync synchronization unit. When K-Synced, each instrument has its moment to ping acoustically unobstructed.

Throughout the expedition, there is continuous seawater sampling with the ship's General Oceanics pCO_2 system. The underway seawater flow circulated with a specially installed plankton-friendly Graco diaphragm pump is shared with the Imaging FlowCytobot (IFCB) brought by the LTER crew.

Taking into account the IFCB, EM stretch hoses and REMUS vehicle, it is remarkable how many instruments on these voyages began their life at WHOI and are now commercially available through the WHOI Tech Transfer program.

With so many pieces of data contributing, technology tells stories. It's all about which instrument is talking and which is hearing and listening to what the ocean is revealing. The gathering of who, where, when, what and why data personifies the natural world.

These projects at sea are a fertile spawning ground for new ideas in the hotbed of ocean engineering. When projects and platforms pool resources, much is accomplished.

To learn more about the Ocean Observatories Initiative, visit oceanobservatories.org. RV *Neil Armstrong* information can be found at whoi.edu/what-we-do/explore/ships/ships-neil-armstrong. **ST**

Amy Simoneau is a senior engineering assistant at the Woods Hole Oceanographic Institution. She has been supporting science at sea for 25 years.

international

EIVA Becomes Part of Sonardyne

Sonardyne International Ltd. has acquired maritime software and equipment specialist EIVA A/S. EIVA will join the Sonardyne group of companies while remaining an independent business and brand. EIVA CEO Jeppe Nielsen will remain in post, while Sonardyne's Investment and Integration Director Stephen Fasham will take on the role of chairman.

ABB Expands Support in Russia

ABB has opened a Marine Service Center in Russia for growing Arctic maritime industries. It will support ABB's ship power, propulsion and automation technologies and expand service capabilities for ice-going vessels.

This builds on a decade of local ABB services in support of ice-going vessels and relies on a strong core of engineering expertise in Murmansk.

Nortek Now in Australia

Nortek has opened the latest of its global network of offices in Melbourne, Australia, to facilitate access to cutting-edge Doppler instrumentation for researchers and engineers in Australia and New Zealand.

This is the company's first office in the region, creating a strong local point of contact for sales and support. The Port Melbourne office also gives Nortek a platform from which to extend its reach in Australia and New Zealand.

Remote Survey for Classification

The Korean Register (KR) has launched a new remote survey service for any of the classification society's vessels engaged in international oceangoing voyages. The scope of KR's remote survey service is limited to classification surveys.

A remote survey is done through bi-directional communication with a vessel by sharing photographs, video and digital images from ship.

Collaboration for Weather Data, Route Planning

NAVTOR has signed a collaboration agreement with Weathernews Inc. (WNI) of Japan, the world's largest privately listed weather service company.

NAVTOR will upgrade its weather information offering within the route planning software NavStation, and WNI gets direct access to ENC and passage planning. This will enable the development of an artificial intelligence (AI) routing service for optimized decision-making tools with real-time capabilities.

KVH Connectivity for Vessel Insight

KVH Industries Inc. announced that Kongsberg is its first major partner for KVH Watch IoT Connectivity as a Service. KVH Watch will provide connectivity for Vessel Insight, a new maritime data infrastructure solution from Kongsberg's Kognifai digital ecosystem.

Vessel Insight enables customers to cost-efficiently capture and aggregate quality data from their assets and securely transfer them to the cloud. Once data are available in the cloud, customers get access to a large range of leading applications and services that can turn their data into business value and optimize performance at sea.

MacArtney, APL Partnership Going Strong

Collaborating for almost two decades, MacArtney and the Applied Physics Laboratory (APL) at the University of Washington have launched the FOCUS 3, APL's latest acquisition in the pursuit of unexploded ordnance detection.

Over the years, APL and MacArtney have worked together on several projects with a comprehensive scope of supply from MacArtney, including the TRIAXUS and FOCUS ROTVs, CORMAC winch launch and recovery system with focal slip ring, SubConn connectors and fiber-optic cabling.

New Member of WOC

ECOncrete has joined the World Ocean Council (WOC) in support of industry action and investment for ocean sustainable development, science and stewardship.

Founded in 2012, ECOncrete offers environmentally sensitive concrete solutions that enhance the biological and ecological value of urban, coastal and marine infrastructure while increasing their strength and durability.

Diver Detection System For FPSO off Israel

DSIT Solutions Ltd., a subsidiary of Rafael Advanced Defense Systems Ltd., was selected by Energean Israel to supply its AquaShield Underwater Security System to safeguard Energean's FPSO unit from underwater threats.

The FPSO will be connected to Energean's Karish and Tanin gas reservoirs located offshore Israel.

AquaShield is an autonomous diver detection sonar (DDS) system.

Design Study for Marine RV Replacement

Knud E. Hansen and DTU Aqua (Technical University of Denmark) have completed the comprehensive design study for a new 65-m multidisciplinary marine research vessel.

Looking ahead, DTU Aqua urgently needs to replace the aging RV *Dana IV* as it is facing a 40-year class survey in 2022.

The purpose of the project was to develop a concept design and budgetary cost estimate for the replacement of the RV *Dana* with scientific capacity and equipment for a highly advanced multidisciplinary research vessel to make DTU Aqua an attractive partner for international scientific projects.

Maritime Public-Private Partnership Milestone

Cooperative Research Ships (CRS) is celebrating its 50-year anniversary, with 20 to 25 maritime organizations performing research in the maritime field together for a yearly budget of around €1.5 million.

pCO_2

General Oceanics, Inc. introduces its **new model 8050 autonomous pCO_2 monitoring system.** Continuous measurement, recording and transmission of sea surface CO_2 levels.

- **Efficient equilibration of sea water and confined air head space.**
- **Infrared analysis of CO_2 concentrations.**
- **Automatic calibration.**
- **Integrated computer and control software.**
- **Integrated GPS location and atmospheric conditions.**
- **Satellite data transmission.**

http://generaloceanics.com/home.php?cat=69

General Oceanics Inc.
1295 N.W. 163 St., Miami, FL 33169
Tel: (305) 621-2882, Fax: (305) 621-1710
E-mail: Sales@GeneralOceanics.com
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Typically, 10 working groups investigate topics that are of common interest to its members. CRS brings together shipyards, shipowners, navies, equipment suppliers, classification societies and research organizations.

Ireland and Netherlands Ports To Strengthen Collaboration

Port of Cork and Port of Amsterdam International have signed a collaboration agreement to research in what areas they can strengthen and support each other.

Themes under consideration are: port development, stakeholder management, cruise development, ports logistics and mitigation of the impact of Brexit.

Digital Ship Development

DSME, Korea Maritime and Ocean University, NAPA and AVL have announced a strategic cooperation agreement to develop digital ships and related strategic solutions. The agreement will combine the four parties' expertise in naval architecture and shipbuilding, engines, big data and software development to pioneer new solutions. The collaboration will cover all aspects of creating comprehensive digital twins.

TerraSond Moves into Acteon

Acteon has completed the acquisition of geosciences survey company TerraSond, a multidisciplinary geospatial and geophysical business with clients in oil and gas, renewables, engineering and mining, telecom, marine construction and the public sector.

TerraSond plans and executes remote surveys, including deep-seabed exploration and mapping projects.

DNV GL Type Approval For Sea Sentry

Chelsea Technologies' Sea Sentry wash water monitoring system for ship exhaust gas cleaning systems has been awarded type approval by DNV GL, meaning that Sea Sentry complies with IMO Annex VI wash water discharge regulations. Accurate wash water monitoring allows owners to mitigate the risk of potential fines and costly delays in port.

Consortium to Tackle Dangerous Cargo

Maritime Blockchain Labs (MBL), founded by blockchain technology and governance experts BLOC and the Lloyd's Register Foundation (LRF), has established a consortium to explore the use of blockchain in tackling the significant risks and challenges associated with the declaration and handling of dangerous goods.

The MBL consortium will build and test a prototype to assess the potential for distributed ledger technology (DLT) to address the challenges faced by stakeholders throughout the supply chain.

Funded by LRF and conducted in partnership with Rainmaking, the consortium includes Copenhagen Malmö Ports (CMP), Flexport, X-Press Feeders, SecureSystem, DSV, PSA, Port+, Agility and MTI. It represents stakeholders throughout the value chain, from ports to carriers to technology and service providers. **ST**

Pocatello Buys Mud Cat Replacement

Ellicott Dredge Technologies (EDT) announced the repeat sale of a Mud Cat auger style cutterhead dredge to the City of Pocatello's Water Pollution Control Department (WPC). The city replaced its 32-year-old Mud Cat MC-815 with Mud Cat's updated MC-225D with 815-style cutterhead. Mud Cat was selected over multiple U.S. bidders and was the only supplier with an ISO 9001:2015 certified factory.

Maturity Level Appraisal for Hydroid

Hydroid Inc., a subsidiary of Kongsberg Maritime, was appraised at Maturity Level 3 of the CMMI Institute's Capability Maturity Model Integration (CMMI) V2.0. The appraisal was performed by JFR Consulting and included a comprehensive examination of Hydroid's business and development processes for AUVs and marine robotics products.

First HullWiper Base in Americas

Vessels transiting the Panama Canal can now take advantage of HullWiper Ltd.'s eco-friendly hull-cleaning solution with the establishment of the first HullWiper operations base in the Americas, in partnership with provider of subsea services Talleres Industriales S.A.

The agreement forms part of HullWiper's global leasing program introduced in 2017, which works with partners around the world to offer shipowners and operators an affordable, brush- and diver-free alternative to traditional hull-cleaning methods that protects both vessel hull coatings and the delicate marine ecosystem.

Rockland Contributes to Ocean Cleanup Nonprofit

Rockland has established a corporate partnership with Big Blue Ocean Cleanup (BBOC), an independent ocean cleanup nonprofit foundation. BBOC prevents and removes ocean pollution to minimize the effects of human development. At Ocean Business 2019, Rockland kicked off an annual donation pledge to BBOC, and in April Rockland transferred £20 for every instrument shipped in the 2018 calendar year.

Company Founded for Great White Shark Deterrence Tech Development

Willy Planinshek and Kevin McCarthy have co-founded Deep Blue LLC to develop underwater acoustic systems designed to deter great white shark attacks along Cape Cod beaches.

Since the passage of the Marine Mammal Protection Act (MMPA) in 1972, gray seal populations in Cape Cod waters have recovered from a highly endangered condition. There are now an estimated 50,000 gray seals around Cape Cod. The increasing population has also brought their primary predator, the great white shark, to the Cape. Ongoing population studies by the State Division of Marine Fisheries indicate there are in excess of 300 great white sharks in Cape waters during the summer and fall months.

PBES Forms Strategic Partnership

PBES and Sterling and Wilson have announced a strategic partnership agreement that entails Sterling and Wilson acquiring a significant portion of PBES equity.

The agreement provides a vehicle to stabilize PBES and move the company forward in its marine electric and hybrid energy storage business.

Unique Group Adds Lab in Houston

Unique Group has launched state-of-the-art survey equipment calibration services from its Houston base. The fully equipped lab will provide calibration services for pressure, temperature, conductivity and sound velocity sensors. In addition, repair and support services will be provided for subsea survey equipment to maintain optimum working performance.

Fishing Vessel Salvaged

Moran Environmental Recovery has completed a joint salvage effort on the fishing vessel *All For Joy* in the Long Island Sound, marking another successful project.

The U.S. Coast Guard ordered the vessel's removal because it was a significant navigation hazard and pollution threat.

The dive team inspected the vessel for damage and found it to be sound. It was returned to its owner for restoration.

Proposed Modifications to Panama Canal Tolls Structure

The Panama Canal published a proposal to modify its current tolls structure for the dry bulk, passenger, containership and vehicle carrier and RoRo segments, as well as tankers, chemical tankers, LPG and LNG vessels, the intra-maritime cluster (local tourism segment) and minimum tolls (small vessels).

The formal consultation period for industry feedback closed in July. After a careful evaluation and analysis of the comments received, and once any pertinent changes are incorporated in the proposal, the Cabinet Council of the Republic of Panama will officially approve the modifications. Implementation of the modifications to the tolls structure is planned for January 1, 2020.

Exclusive Marpower Dealer

Nauti-Tech Systems is now the exclusive Marpower dealer in North America. The agreement expands the company's ability to service large vessels with unique power needs, including ships and superyachts.

Homeport Chosen for Polar Security Cutters

The U.S. Coast Guard announced that Seattle, Washington, will be the home of the service's new polar security cutters. The addition of these vessels in Seattle will support the United States' ability to conduct national missions, respond to critical events and project American presence in the high latitudes.

The Pacific Northwest has been the home of the Coast Guard's icebreaking fleet since 1976.

Arctic Rays Works with L3 on UUV Strobe Lights

Arctic Rays LLC has delivered custom-manufactured LED strobe lights to L3 Technologies. Named "Remora," the high-intensity strobe lights are fitted into L3 Technologies' Iver UUV platform. The light is electrically synchronized with the onboard camera to capture crisp images, even in low-light environments. This imagery is used for habitat mapping, pipeline, structure survey and photogrammetry missions.

BIRNS Celebrates 65th Anniversary

In 1954, exploration in the subsea industry was in its infancy. Some of the first unmanned submersibles were introduced in the 1950s. Nearly seven decades later, depth ratings for subsea systems have exponentially changed, and so have connectivity solutions. BIRNS has been proud to have played a role in the advancement of high-performance lighting and connector systems for the subsea market for the last 65 years.

The company was born in Los Angeles, California, and quickly became known for contributing key technology to the marine and nuclear industries. Early marine market contributions include illuminating the excavation of the *Titanic*.

AAPA Names Communications Award Winners

The American Association of Port Authorities (AAPA) has announced the winners of the trade association's 53rd annual Communications Awards Program. The recipients of the 2019 Overall Award of Communications Excellence trophies are: Port of San Diego (Category 3), Port of New Orleans (Category 2) and Port Milwuakee (Category 1). Each of these winners represent a different category of port, based on the size of its public relations, advertising and marketing budget.

The competition helps member ports by rewarding strategic communications through peer-reviewed analyses of their programs and projects and by showcasing best practices and lessons learned.

Fugro RAMMS for Caribbean Mapping

Fugro is contributing to a coastal mapping project in Jamaica and Haiti to support The Investment Plan for the Caribbean Regional Track of the Pilot Program for Climate Resilience. Fugro will use its Rapid Airborne Multibeam Mapping System (RAMMS) for nearshore and coastal mapping. Fugro is now operating the system in Jamaica. The data will be used to assess coastal vulnerability and conduct climate analysis related to sea level rise, storm surges and flooding in the Caribbean.

MSI Becomes KOHLER Distributor

Marine Systems Inc. (MSI) is the newest distributor for KOHLER's marine generators. Based in Seattle, MSI is now the exclusive distributor of this technology in a territory including Washington, Oregon, Colorado, Wyoming, Utah, Idaho and Alaska. **ST**

Microplastics Accumulate In Deep-Sea Hotspots

Recent research reveals that microplastics often accumulate on the deep seafloor in the same place as diverse and dense marine life communities. This is because the same submarine sediment flows that transfer the oxygen and nutrients needed to sustain life also transport microplastics from urban rivers to the deep seafloor via pathways such as submarine canyons.

This research between the U.K. National Oceanography Centre (NOC) and University of Manchester is part of a collaboration with IFREMER in France, University of Bremen in Germany and Utrecht University in the Netherlands called SCAMPI (Seafloor Currents And Microplastics Investigation), which aims to investigate the role of seafloor currents in controlling the distribution of microplastics in the ocean.

Only about 1 percent of the plastic in the ocean floats on the surface. Most of the rest sinks. Ocean currents and other near-seafloor flows appear to control where the sinking plastic ends up. Developing a basic understanding of the processes that control the distribution of microplastics will aid understanding of where and how they enter the food chain through seafloor marine life.

Surprising Enzymes Found In Giant Ocean Viruses

A new study led by researchers at Woods Hole Oceanographic Institution (WHOI) and Swansea University Medical School furthers the knowledge of viruses in the sea and on land and their potential to cause life-threatening illnesses. The findings, which examine newly identified genes carried by mysterious "giant" viruses, could represent potential new drug targets for giant viruses linked to human diseases.

An international team of researchers searched more than 8,000 virus genomes and found that many newly discovered giant viruses contain multiple genes for a type of enzyme called cytochrome P450. P450 enzymes are common in animals, plants and bacteria, but finding them in new viruses is unexpected. Prior to the giant viruses, it was never considered that viruses would have these genes.

In animals, P450 enzymes metabolize drugs, make steroid hormones and defend against pollutants. P450 enzymes, which constitute one of the largest enzyme superfamilies known, may also have major implications for understanding chemical effects both in the sea and in human disease processes.

Some giant viruses may be linked to some forms of pneumonia, so gaining a better understanding of them will help to develop ways of tackling those viruses. The P450s could represent drug targets for giant viruses thought to contribute to some pneumonias.

Viruses are the most numerous biological entities on Earth. Increasingly, giant viruses are being found in the oceans, including in the deep sea.

Freshwater Rock-Eating Shipworm Found in Philippines

A newly identified genus and species of worm-like freshwater clam, commonly known as a shipworm, eats rock and expels sand as scat while it burrows like an ecosystem engineer in the Abatan River in the Philippines.

Local residents of Bohol Island tipped off an international group of scientists, including University of Amherst post-doctoral researcher Reuben Shipway, to the watery location of the bivalve.

The scientists named the shipworm *Lithoredoabatanica*, using the Latin words for rock (litho) and the last two syllables of shipworm (teredo).

Locals call the shipworm "antingaw," and new mothers are said to eat them in an effort to enhance lactation, Shipway said.

These animals are among the most important in the river and in this ecosystem. As they bore elaborate tunnels in the limestone bedrock, they change the course of the river and provide a really rich environment for other aquatic species to live in.

So far, the Abatan River is the only place on Earth where this bivalve is known to exist. It's the second new genus and species of shipworm recently discovered in the Philippines by the team of researchers known as the Philippine Mollusk Symbiont International Collaborative Biodiversity Group, funded by the National Institutes of Health.

Crustacean Tree Shows 450-Million-Year Evolution

Researchers have for the first time traced the roots of crabs, lobsters and shrimp to create the family tree of crustaceans people love to eat. The tree shows the 450-million-year evolution of these 10-legged decapods. Lobsters and crabs each diversified from a single evolutionary origin, while groups of shrimp evolved earlier.

The findings are part of a massive family tree project for which researchers resolved the deep evolutionary relationships between crabs, shrimp and lobsters.

The discoveries made by analyzing more than 400 genes from 94 species could also inform conservation policies to ensure their longevity.

The boom of diversification for crabs, lobsters and shrimp may coincide with the spread of modern reef-building corals. It is possible the emergence of reef-building corals provided new habits for decapods to colonize and diversify, leading to the emergence of several new lineages after the mass extinction of life on Earth 250 million years ago.

While the study produced the largest amount of genetic information about decapods, more work remains, including adding species to better understand species-level relationships. This work is part of the Decapod Tree of Life project, an initiative seeking to uncover the relationships of crab, lobster and shrimp across their hundreds of millions of years on Earth. **ST**

productdevelopment

For more information on any of these products, visit our website at **www.sea-technology.com/products**

East African Green Hull Cleaner

An ROV system uses adjustable seawater jets under variable pressure to remove fouling, instead of brushes or abrasives, minimizing the risk of damage to expensive anti-fouling coatings. No divers are used, so there is no risk to human life and cleaning can be conducted day or night, in most weather conditions, and while cargo operations are underway. HullWiper Ltd., Immersub.

Digital Pressure Gauge

Crystal XP2i has an ultralow-power (ULP) mode through the optional DataLoggerXP firmware upgrade for long-term pressure data recording. By using the ULP mode and an extended logging interval of one reading every 17 min., the XP2i with the optional DataLoggerXP upgrade will last more than one year. AMETEK STC.

Two-Way Monitoring and Control

Star2M enables remote monitoring and whole-of-life asset management for fixed and floating marine assets in ports and harbors. This platform provides secure connectivity and diagnostic information to receive battery status, asset location, remote control configuration and alarms. Sealite Pty. Ltd.

Energy Storage System

Corvus Blue Whale is suitable for cruise ships, Ro-Pax and Ro-Ro. It is ideal for applications that require low charge/discharge rate combined with very high energy demand. Corvus Energy.

Digitalization Infrastructure

Vessel Insight is a subscription-based service that enables customers to cost-efficiently capture and aggregate quality data from their assets and securely transfer them to the cloud. Through the Kognifai Marketplace, customers can access applications and services that can turn their data into business value. Kongsberg.

Cable Protection System

NjordGuard protects offshore wind farm power cables in wind turbine generators and offshore substation platforms. Its abrasion-resistant API 17L certified Uraduct material enables the system to travel over the seabed without damage, extending cable life. It facilitates easier installation, reuse and removal without diver and ROV intervention. Trelleborg Offshore.

Internet of Things Connectivity

KVH Watch is a connectivity solution for remote equipment monitoring and intervention by maritime equipment manufacturers and Internet of Things (IoT) application providers. Manufacturers can act in real time, minimizing expensive service calls and ensuring that their equipment is performing at its peak. KVH Industries Inc.

Decision-Support Tool

Bridge Operational Quality Assurance (BOQA) is a scalable cloud-based event-reporting, analysis and feedback solution that is integrated with the DanelecConnect shipboard IoT platform. It provides automatic recording and transmission of data from ship navigation systems and sensors through the DanelecConnect hub to shore offices and uses analytical tools to identify deviations from operational parameters. Danelec Marine A/S.

Route Optimization

NaviPlanner BVS and NaviUpdate are new versions of BVS. NaviPlanner BVS simplifies the process of planning and optimizing a route, obtaining the appropriate charts and creating a voyage plan without switching between products. NaviUpdate connects NaviPlanner securely to the ECDIS for direct transfer of routes and charts. StormGeo.

Sea Scooter

MagicJet has three water propulsion methods and a GoPro mount. The 15.2 x 14.2 x 7.2-in. design features an ultraquiet 600-W engine powerful enough to pull two adults. Aquarobotman Science & Technology Co. Ltd.

Power for Complex Electronics

The Supreme Pro battery charger series comprises four 24-V chargers with charging powers of 40, 60, 80 or 100 amps, respectively, and universal auto-ranging input (90 to 265 V AC, 50 to 60 Hz). The charger can easily be connected to external analog or digital control panels. WhisperPower.

Digital Management System

Roxtec Transit Registry enables complete control, documentation and tracking of all transits through the entire life cycle of an asset. It keeps all relevant information on each transit installation on board

accessible and up to date and provides instant information on cable and pipe transit status. Roxtec International AB.

Inertial Measurement Unit

The LandMark 005 IMU with low-noise sensors, high-speed VELOX technology and a SWaP-C design is perfect for control and stabilization applications demanding precision performance over a range of rugged environments. Gladiator Technologies.

Engine Performance Software

Offering an easy-access web portal interface, ABB Ability Tekomar XPERT for fleet provides accurate insight into engine performance from fleet to vessel level, with all key indicators available at a glance. ABB Turbocharging.

Lightweight Excavator

The SP2000 ULD is used for shallow-water excavation and shore pull works, including trench maintenance during pull-in operations, post-trenching and backfilling. It is capable of pipeline and cable deburial for inspection, repair and maintenance, seabed preparation, freespan correction and rock dump dispersal. James Fisher Subsea Excavation.

AUV

Utilizing a patented buoyancy engine, the MOD2 Glider can carry large payloads through a range of water conditions without manual ballasting or user intervention. Greensea's OPENSEA platform powers the glider. Exocetus Autonomous Systems.

Offshore Flow Measurement

Adjusta-Cone is an automatic and fully adjustable differential pressure cone meter for natural gas. Integra-Cone is a high-pressure nitrogen flow meter. GM Flow Measurement Services Ltd.

Network Security Software

DxConnect enables developers and network administrators to build an integrated ZT connectivity security infrastructure for cloud native applications, hybrid/multi-cloud connectivity and privileged user access without using a VPN. DH2i.

Diver Launch and Recovery

Comprising a hydraulic A-frame, two top-mounted man-riding winches, a two-man stainless-steel dive basket with two independent hydraulic power units and a single electrical control box, the diving LARS is designed for the deployment and recovery of commercial divers. Northern Diver International. **ST**

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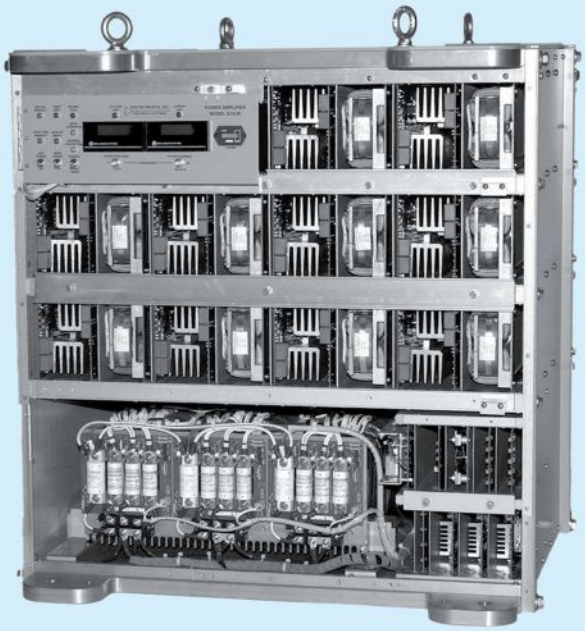

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Wind-Powered Water Injection Becoming Reality

DNV GL is urging offshore oil and gas operators to implement a new solution using floating wind turbines to power water injection for oil recovery. WIN WIN (WINd powered Water INjection) was conceived in 2013 by DNV GL and is now ready for prototype development after two joint industry projects have shown the concept to be both cost efficient and technically feasible.

Water injection is an effective tool in exploiting oil reserves, but the process is often inhibited by the high costs associated with large gas or diesel generators and complicated subsea infrastructure.

By using a floating wind turbine, the WIN WIN concept allows the injection system to operate independently, eliminating the need for long flowlines from the platform.

Offshore Wind Foundation Design Under Testing

HR Wallingford is conducting extensive physical model testing for a potentially revolutionary new offshore wind foundation known as the Gravity Tripod. The company is working with Offshore Design Engineering (ODE), DNV GL, Cambridge University and the Offshore Renewable Energy (ORE) Catapult to test and certify the new offshore wind foundation concept designed by Offshore Wind Logistics and Construction (OWLC).

Funded by the Department for Business, Energy and Industrial Strategy (BEIS), a team of renewables experts are taking the Gravity Tripod foundation though a series of stages, with certification from DNV GL, in preparation for demonstration of the design with a prototype structure. Design work and optimization will be undertaken by ODE, with testing of the physical components conducted by ORE Catapult. Cambridge University will conduct geotechnical sediment modeling, looking at the interaction between the structure and seabed. HR Wallingford will conduct extensive physical model testing to investigate the loads applied to the structure during installation, those caused by exposure to large waves once the foundation is in place, and to determine the amount of erosion (scour) that may develop around the base of the structure if left unprotected.

DiCaprio Climate Doc Premieres at Cannes

A major documentary on climate change, featuring Orkney's pioneering marine energy work, premiered at the Cannes Film Festival. "Ice on Fire" was produced by Leonardo DiCaprio and narrated by the actor, who has a strong interest in climate change and ecological issues.

Directed by Leila Conners of Tree Media, the documentary aired on HBO in the U.S. in June.

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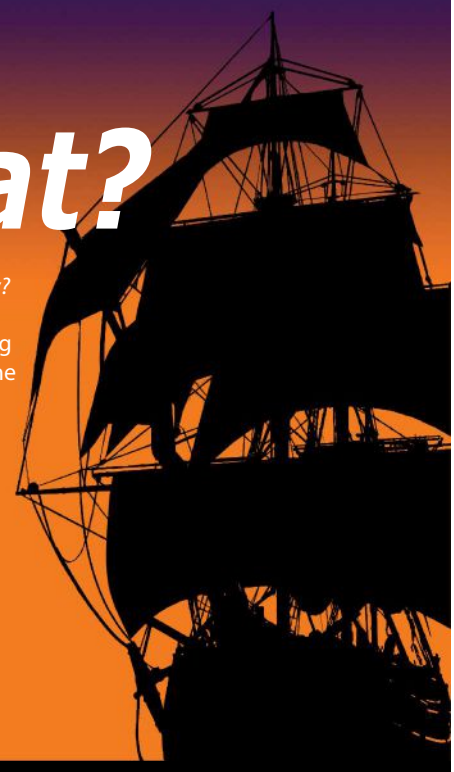

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"Ice on Fire" asks whether humanity can now reverse climate change, highlighting the critical impact that rising global temperatures and climate instability are having on the planet. The film explores the efforts being made around the world to bring CO_2 out of the atmosphere and pave the way for a reduction in global temperatures.

The Orkney segment of "Ice on Fire" focuses on Orbital Marine Power's tidal turbine and the work of the European Marine Energy Centre (EMEC).

WSM Expands Presence In Wind Energy Market

Wilhelmsen Ship Management (WSM) strengthens its foothold in the renewable wind energy market through acquisition of a 50 percent share of NorSea Wind AS.

NorSea Wind, founded in 2016 as a subsidiary of Norsea Group, provides project management and logistics planning through all stages for on- and offshore wind farm projects.

WSM and Norsea Group are part of the Wilhelmsen group. NorSea Wind will be positioned as the group's platform toward the global renewable wind energy market.

LDA Group Joins International Windship Association

Interest in using wind-assist and primary-wind propulsion solutions in shipping is growing, as is the need to reduce fuel costs and future-proof vessels in preparation for decarbonization costs.

The Louis Dreyfus Armateurs (LDA) Group has become the latest member of the International Windship Association (IWSA) to help further the development of these primary renewable solutions.

LDA Group owns, charters and operates more than 100 vessels worldwide and has been searching for ways to significantly reduce emissions along with its customer Airbus. The positive results garnered from the testing of the Airseas kite system has led to the decision to have one permanently fitted on board the 21,500-ton MV *Ville de Bordeaux* from 2020 onward. This RoRo cargo vessel is dedicated to the transport of Airbus parts around Europe.

In early 2019, LDA initiated the design of a large transoceanic RoRo vessel with fully integrated wind-assisted propulsion and will continue development work in this field.

Analyses Verify Rotor Sail Saves on LNG Fuel

Independent test results show that Norsepower's Rotor Sail technology has great potential to deliver savings on the Viking Line-owned and operated MS *Viking Grace*. Long-term LNG marine fuel savings are expected to be up to around 300 tonnes annually. When NAPA and ABB reviewed the data, they were able to isolate an evident change in the propulsion power breakdown of *Viking Grace* caused by the Rotor Sail. Viking Line and Norsepower have agreed to continue using and optimizing the Rotor Sail on the MS *Viking Grace*. **ST**

Industry Supports Youth Subsea Innovation

MacArtney Benelux continues to sponsor and support young minds to develop innovative underwater technology solutions via the international MATE ROV competition and the WASUB human-powered submarine team from the Delft University of Technology.

This year, MacArtney Benelux advised TU Delft in developing the LOBSTER Explorer, a small, fast, low-cost, autonomous deep-sea robot for inspection, prospecting and research. MacArtney Benelux provided test facilities and expertise, along with access to MacArtney's SubConn connectors.

Grant to Fund Powerpack Development

Armada Engineering is developing an innovative new powerpack for marine applications, with the aid of a £27,000 grant from Marine-i.

Partly funded by the European Regional Development Fund, Marine-i is designed to help the marine tech sector in Cornwall and the Isles of Scilly grow through research and innovation.

Armada Engineering has devised a mobile powerpack that can be deployed for a wide range of marine maintenance tasks, including hydraulic flushing.

More Cybersecurity Guidelines Released

ClassNK has released its Guidelines for Software Security, which target software developers and system integrators. As part of the ClassNK Cyber Security Series, ClassNK regularly releases guidelines and standards that outline cybersecurity measures based on the recently released ClassNK Cyber Security Approach for ships.

The Guidelines for Software Security, available at www.classnk.com, aim to assist with risk management focused on software on board vessels. They outline the recommended security measures to take throughout the development, integration and operation stages of the software. The Guidelines for Software Security were developed in collaboration with ClassNK's partner TÜV Rheinland.

Agreement to Enhance Maritime Digitalization

DNV GL and Kongsberg have signed a memorandum of understanding to help bring about digitalization of the maritime industry and greatly enhance customer benefit and ease.

In the maritime industry, digitalization and the use of data will have a huge impact. There are a great number of providers offering digital solutions to the maritime industry, and shipowners would benefit from data infrastructure standardization and access to business ecosystems connecting all relevant digital solutions or services.

Kongsberg's Kognifai and DNV GL's Veracity will, combined, give customers access to platform capabilities and an ecosystem of value-enhancing services.

Collaboration on Digital Solutions for Shipping

Lloyd's Register (LR) and Hyundai Global Service (HGS) have announced a new collaboration that will deliver added value to the shipping industry through digital solutions, starting with the appraisal of HGS's Smart Ship System as "Digital Class Ready."

LR will assess HGS's Smart Ship System by applying its latest Digital Ship's ShipRight Procedure and Digital Compliance Framework so that ship managers and operators using the system on board ships can get class items credited remotely for selected items.

HGS and LR will engage in live trials of the system, installed and operational on a ship, and test its readiness to comply with data-driven classification requirements. These tests will prove how the chosen surveyable item would become eligible to be class-item credited based on data streamed from the HGS Smart Ship System remotely.

HGS and LR also intend to create a digital interface between HGS's Smart Ship System and LR that would allow class-items crediting to be undertaken digitally.

LiDAR Helps Bring 'Game of Thrones' to Life

Teledyne Technologies Inc. announced that imaging hardware and software from Teledyne Optech helped enable 3D spatial data acquisition and visual effects for HBO's hit series "Game of Thrones." Teledyne's LiDAR technology was used to create a detailed 3D representation of the old city of Dubrovnik, the model for the fictional city of King's Landing.

3D point clouds were generated in Dubrovnik using various LiDAR technologies, including Teledyne Optech's Maverick mobile LiDAR system and Polaris fixed terrestrial scanner.

The point clouds were then colorized with digital camera imagery and image-fusion software.

Private Network to Enable Industrial Internet of Things

Kalmar, part of Cargotec, and Ukkoverkot, an LTE network provider, have signed a two-year cooperation agreement with Nokia to design, build and operate a private LTE network. Nokia brings the digital automation platform that is well suited for mobile machinery and industrial Internet of Things.

A test network reflecting an actual terminal environment will be built for research and development. Machine-to-machine communication will be tested in the new private 4G/LTE (long-term evolution) environment and compared against previous wireless technologies to develop business applications. This connectivity technique is more reliable and enables more secure communication than Wi-Fi. Private LTE provides the low-latency, high-capacity connectivity combined with edge-computing required for time-sensitive critical industrial applications, enabling real-time analytics and video-based applications such as machine remote control. **ST**

people

PMI Industries Inc. has hired **Brad Moore** as manager of sales and marketing. He will be responsible for leveraging PMI's brand worldwide and directing the company's sales efforts. He was recently the senior business development manager at Beckett Energy Systems and has an M.B.A. in marketing and finance from the University of Chicago and a B.S. in chemical engineering from Iowa State University.

Chris Malzone has joined AML Oceanographic as vice president of sales and marketing. He has more than 25 years of experience in marine technology, having held positions from research scientist and engineer to vice president and general manager. His experience working for a wide variety of blue organizations and his M.S. in oceanography/geology has given him a comprehensive understanding of the oceanographic marketplace.

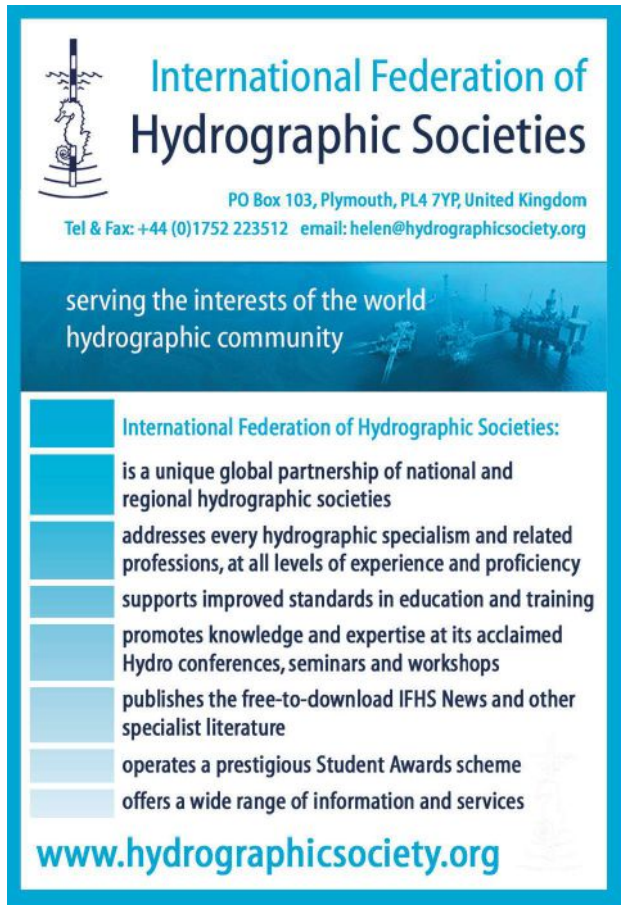
KVH Industries Inc. has named **Ken Loke** vice president – Asia Pacific to direct all initiatives for KVH in this important region. Loke has extensive experience in satellite and managed services with top companies active in the telecommunications and maritime industries.

Unique Group has appointed **Matthew Gordon** as regional vice president for the Europe and U.K. region to oversee the company's strategic expansion plans. He will be based in Aberdeen.

After more than nine years as president of NOIA, **Randall Luthi** has decided to leave Washington, D.C., to work for the governor of Wyoming on energy and environmental policies. The new president is expected to be in place before NOIA's Fall Meeting in October.

ROVOP has announced its expansion into mainland Europe with the appointment of **Job Biersteker** as business development manager in its new facility in Rotterdam. Biersteker has been active in the subsea industry for nearly a decade and has had various positions in the industry, including ROV technician, project engineer and project manager.

N-Sea Holding has appointed **Arno van Poppel** as chief executive. He succeeds **Gerard Keser**, who steps down from his current role after eight years with the company to take up a position on the company's advisory board. Van Poppel has a solid track record in the marine-contracting environment. **ST**



Long Island Benefits From Sugar Kelp Farming

A new wave of small owner-operated oyster farms is revolutionizing New York's marine aquaculture industry, but a lack of crop diversification leaves these farms vulnerable to crop failures and/or downturns in the market for oysters.

This winter, a collaborative team including marine scientists at Stony Brook University (SBU), 3D ocean-farming innovators at the nonprofit GreenWave, local seafood industry pioneers from Dock to Dish and Haskell Seafood, and several Long Island oyster farmers worked on a grant to SBU from the New York Farm Viability Institute to bring the sugar kelp seaweed crop to Long Island.

The team deployed commercial-style lines of kelp on oyster farms in three estuaries around Long Island. In just three months, kelp blades have grown to over 4 ft. at one of the sites.

Kelp farming can provide Long Island oyster farmers with a means to diversify crops, create additive revenue streams, and further contribute to the sustainability and health of Long Island's estuaries through restorative aquaculture.

Canada Moves Further to Protect Marine Biodiversity

The government of Canada has adopted strong standards for marine protected areas (MPAs), including the prohibition of oil and gas development and bottom trawling.

All newly created MPAs will prohibit oil and gas, bottom trawling, mining and dumping within their limits.

Canada, which has the longest coastline of any country, is committed to protecting 10 percent of its coasts and ocean by 2020, in line with international biodiversity targets.

In addition, Canada is in the process of modernizing its Fisheries Act and amending both the Oceans Act and the Canada Petroleum Resources Act. When passed into law, these reforms will provide a strong framework to protect both marine species and indigenous and coastal communities where people's livelihoods are intricately tied to healthy marine environments.

OTEC Technology Advances With Grant Money

Last September, Global OTEC Resources received a £140,000 grant from Marine-i which enabled the company to establish its operation in Cornwall. The company plans to use ocean thermal energy conversion (OTEC) technology to provide green energy to off-grid islands across the tropics.

Partly funded by the European Regional Development Fund, Marine-i is designed to help the marine tech sector in Cornwall and the Isles of Scilly grow through harnessing the full potential of research and innovation.

Global OTEC Resources announced that it has successfully completed the initial designs and feasibility studies for this cutting-edge project and is already progressing to detailed design of the key components, with the aid of a further £80,000 grant from Marine-i.

The biggest technical challenge for the next stage will be finalizing the detailed design of the seawater intake and outtake pipes, which are of fundamental importance for the operation of the plant. The coldwater intake pipeline must transport tonnes of seawater every second through a pipeline that is suspended almost a mile vertically from a floating barge.

This a highly ambitious project which could put Cornwall at the center of an important marine technology of the future.

Underwater Video Supports Aquaculture Fish Farms

Aquaculture specialists perform their research to gain knowledge and develop skills in the farming of aquatic life and to better understand the necessary tasks for the preservation of these species. The United Nations Food and Agriculture Organization (FAO) has determined that 50 percent of the world's food-fish come from aquaculture fish farms. With a skyrocketing global population and food demands growing at an incredible rate, the aquaculture specialist's job is no easy task.

The first necessity is having the right tools for the job. JW Fishers' underwater video systems are a useful tool for underwater research. The DV-2 dropped video system can be mounted in a frame and set on the seafloor for fish observations in their natural habitat. It comes with a 500-ft.-depth-rated housing. Users of the tech include Sweeney International Marine Corp. and SIMCorp Marine Environmental Inc., operating under the umbrella of SIMCorp.

Lobster Sledge Upgrade For Population Monitoring

In 2009, MacArtney supplied the Swedish University for Agriculture and Sciences (SLU) with a camera and light system that utilized direct telemetry and standard cabling for the original Lobster Sledge for investigation into lobster stocks.

A decade later MacArtney is still collaborating with SLU and has completed the co-design of the Lobster Sledge upgrade that incorporates an HD camera, LED lights, fiber-optic multiplexer and interfaces. The system, to be towed along the seabed, collects data on the lobster population and informs fishing quotas for the southern coast of Norway and the Swedish coast.

The Norwegian lobster is a commercially important species in the waters of Norway and Sweden, and fisheries have expanded rapidly to exploit this valuable market. Academic organizations like SLU are collecting vital data to monitor lobster stocks and help standardize data acquisition for successful ecological management.

The Lobster Sledge system is designed to be fully compatible with the infrastructure and winches of the new SLU research vessel. MacArtney has also provided the vessel with a FOCUS 3 and TRIAX-US ROTV and CTD. **ST**

meetings

SEPTEMBER

September 1-6—European Wave and Tidal Energy Conference, Naples, Italy. ewtec2019@ewtec.org or https://ewtec.org.

September 2-3—MAST Advanced Workshop on Disruptive Technologies: Following Disruptive Technologies – Northern Coasts, Copenhagen, Denmark. https://mastconfex.com/maw2019.

September 3-6—SPE Offshore Europe, Aberdeen, Scotland. www.offshore-europe.co.uk.

September 8-11—SMM Hamburg, Hamburg, Germany. +49 (0)40 3569-2445 or nora.ebbinghaus@hamburg-messe.de.

September 9-13—London International Shipping Week, London, England. +44 1295 814455, sales@shippinginnovation.com or http://londoninternationalshippingweek.com.

September 10-13—Defence & Security Equipment International, London, England. +44 20 7384 7770, enquiries@dsei.co.uk or www.dsei.co.uk.

September 13—Arctic Day, Washington, D.C. asnehq@navalengineers.org or www.ArcticDay.org.

September 15-20—SEG 2019, San Antonio, Texas. 918-497-4644, registration@seg.org or www.seg.org/am.

September 16-20—NMEA and RTCM Marine Electronics Conference and Expo, Portsmouth/Norfolk, Virginia. 410-975-9425, mreedenauer@nmea.org or www.expo.nmea.org.

September 16-20—OceanObs'19, Honolulu, Hawaii. 202-448-1245, cyanoff@oceanleadership.org or www.oceanobs19.net.

September 19—NOIA-OMSA Offshore Wind Summit, New Orleans, Louisiana. nnye@noia.org.

OCTOBER

October 2-3—OilComm, Houston, Texas. dmuirhead@accessintel.com or www.oilcomm.com.

October 3-5—INMEX SMM India, Mumbai, India. nora.ebbinghaus@hamburg-messe.de or www.inmex-smm-india.com.

October 6-9—Teledyne Marine Technology Workshop, San Diego, California. Margo.newcombe@teledyne.com or www.teledynemarine.com/tmtw2019.

October 7-9—Offshore Energy Exhibition & Conference, Amsterdam, Netherlands. +31 10 209 2600, marketing@offshore-energy.biz or www.offshore-energy.biz.

October 8-10—PACIFIC 2019, Sydney, Australia. +61 (0)3 5282 0500, expo@amda.com.au or www.pacificexpo.com.au.

October 15-17—RECSO Enviro-Spill Conference & Exhibition, Abu Dhabi, United Arab Emirates. vishak@iconex.in or www.recsoenvirospill.org.

October 27-31—OCEANS 2019 Seattle, Seattle, Washington. info@oceans19mtsieeeseattle.org or https://seattle19.oceansconference.org.

October 28-31—CLEAN GULF Conference & Exhibition, New Orleans, Louisiana. www.cleangulf.org.

October 29-31—Challenge of Science Leadership Training Course, Oban, Scotland. info@sciencileadership.co.uk or www.sciencileadership.co.uk.

October 30-November 1—SNAME Maritime Convention, Tacoma, Washington. https://snameconvention.com.

NOVEMBER

November 4-6—Oceans in Action, Gulport, Mississippi. laurie.jugan@usm.edu or www.mtsociety.org/oceans-in-action.

November 5-7—International Conference on Marine Engineering and Technology Oman, Muscat, Oman. www.icmetoman.com.

November 6-7—ASNE Design Sciences Series Workshop: Digital Engineering: Digital Twin, Washington, D.C. 703-836-6727, asnehq@navalengineers.org or www.navalengineers.org/Symposia/Design-Sciences-Series-Digital-Engineering-Digital-Twin-2019.

November 10-14—International Water Conference, Orlando, Florida. 412-261-0710 ext. 13, t.bombalski@eswp.com or www.eswp.com/water.

November 18-22—BlueTech Week, San Diego, California. mbjones@themaritimealliance.org or https://www.bluetechweek.org.

November 20-21—Combat Systems Symposium, Arlington, Virginia. 703-836-6727, asnehq@navalengineers.org or www.navalengineers.org/Symposia/Combat-Systems-Symposium-2019.

November 20-22—Sustainable Ocean Summit, Paris, France. info@oceancouncil.org or www.oceancouncil.org.

November 21-23—Pacific Marine Expo, Seattle, Washington. 207-842-5666, cdimmerling@divcom.com or www.pacificmarineexpo.com.

November 28-30–International WorkBoat Show, New Orleans, Louisiana. 508-743-8567, info@workboatshow.com or www.workboatshow.com.

DECEMBER

December 4-5—Maritime Security & Coastal Surveillance, Singapore. +65 6722 9388, KunLim.Lau@iqpc.com.sg or https://bit.ly/2XqMeIu.

For more industry meetings, visit sea-technology.com/meetings. **ST**

contracts

BIO-UV Group, Lunel, France, has signed a cooperation agreement aimed at providing shipowners with a complete turnkey solution for the BIO-SEA advanced ballast water treatment system. TECO Tech.

SevenCs, Hamburg, Germany, has announced an agreement relating to the use of the Nautilus SDK Kernel in the development of new TECDIS units and cooperation regarding the distribution of electronic navigational data. TELKO.

Kongsberg Maritime, Kongsberg, Norway, has won orders for a project combining Kongsberg control and electrical systems with power, propulsion and mooring solutions. Kongsberg systems will optimize operations on the second newbuild Awilco Drilling Owned Moss CS60Eco semisubmersible drilling rig. Keppel Offshore & Marine.

Kawasaki Kisen Kaisha Ltd. (K Line), Tokyo, Japan, announced a 20-year agreement to install and service one ship with Seawing, an automated kite based on parafoil technology used to tow commercial ships and reduce CO_2 by 20 percent through wind propulsion. Airseas.

Oceaneering International Inc., Houston, Texas, has secured a contract to perform the first-ever deepwater AUV survey in Mexican waters. It will take place at the Trion block. BHP.

exactEarth Ltd., Cambridge, Canada, has entered into a three-year channel partner agreement for exactView RT data to be incorporated into online maritime services to help bring real-time, business-critical and actionable vessel information to industry. MarineTraffic.

Kraken Robotics Inc.'s wholly owned subsidiary, Kraken Robotic Systems Inc., Mount Pearl, Canada, has received a purchase order for a KATFISH 180 system, to be deployed as part of the SeaScout expeditionary system for seabed mapping and intelligence. Thayer-Mahan Inc.

ABB, Zurich, Switzerland, will deliver benefits of integrated vessel systems to two dredgers built by Keppel Offshore & Marine, securing a first full-scope power, automation and navigation contract for the specialized dredger market. Van Oord.

The World Ocean Council, Honolulu, Hawaii, has signed a memorandum of understanding on long-term cooperation to support marine meteorological and oceanographic observations and services. World Meteorological Organization.

JFD, Aberdeenshire, Scotland, will work with a provider of turnkey ship mobilization solutions to ensure rapid vessel mobilization of JFD's submarine rescue assets to minimize the time to first rescue and optimize the chances of a successful rescue. Malin React.

PortX, Rotterdam, Netherlands, has signed a new strategic partnership agreement to combine PortX's AI-based port dispatching system, OptiPort, with Helm CONNECT harbor dispatching and operations software. Helm Operations.

Sparrows Group, Aberdeen, Scotland, has been awarded its first contract for rigging loft maintenance services in Qatar. The four-year contract includes provision of services for the refurbishment, repair, load test and recertification of rigging lofts and contents. Undisclosed.

The Nautical Institute, London, England, has signed a memorandum of understanding to help developing countries meet international maritime standards in safety, security and environment protection. International Maritime Organization.

DeepOcean AS, Oslo, Norway, has been awarded a contract related to installation of the Vigdis Boosting Station and associated in-field structures and flexibles. Equinor. **ST**

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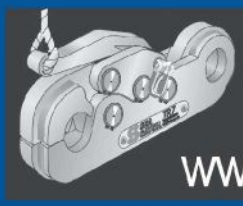
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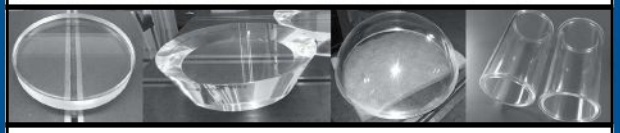
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The Path to Optimal Offshore Resource Management—*Lee Clarke*

Lee Clarke is the general manager for the U.S. and Europe, the Middle East and Africa at Dynama. He is responsible for sales and customer-facing teams, working to ensure that each customer maximizes the utility of Dynama solutions to achieve business and customer success. He has more than 20 years' business and IT experience in consultancy, management and software development.

As if the hazardous working environment of offshore engineering is not harsh enough, there are ever more new challenges facing offshore organizations today. With new safety regulations and tougher penalties for noncompliance, growing skills shortages and increasingly complex projects, managers need to juggle many different processes to bring remote operations and people together. All this must be achieved successfully and within budget to enable organizations to compete in a sector that is undergoing huge change and consolidation.

The end-goal is to reach optimal levels of staffing and other resources, while containing costs and ensuring regulatory and safety compliance. Finding the right skilled workers, checking their availability and qualifications, preparing them for travel and paying them correctly as vessels move across international waters are just the start of the process. Specialist equipment must also be well maintained and in the right location.

Getting everything "ship-shape" for offshore organizations involves critical planning and preparation. An inventory of capital equipment that is regularly serviced and cleaned is essential, but it's no good if a drill or testing system is not in the right place at the right time. The same with employees—you may have well-trained, highly specialist crews who are just right for a particular job, but you will have to hire others if certifications lapse halfway through a project or individuals have annual leave owed.

At Dynama, we have worked with many maritime organizations and identified that while no two organizations tackle resourcing challenges in the same way, there are some key areas common to all. Today's workforce management (WFM) technology can assist with addressing these challenges and deliver significant benefits along the way. There are six steps to get a 360° view of offshore operations, with the help of workforce management technology.

Step one is optimal resourcing. It's crucial to know what you have and where it is to run offshore operations efficiently. Scheduling and deploying resources in terms of vessels, crew and equipment is essential and made easier by having the information in one central system. Even better, the ability to run "what if" scenarios to balance demand with costs and budgets before committing any expenditure pays dividends.

Step two is staff engagement. Building flexible schedules that take into account staff skills, holidays and personal preferences helps to build trust and loyalty among crew members, which is essential in such a competitive industry. Today there are self-service tools available that empower crew to self-manage shift swaps and time off, which has been found to improve morale.

Step three is to keep in mind that change happens—whether operational, regulatory or within the industry. Preparing for change is vital. Responding quickly with a decision relies on having the right information on hand. An immediate enterprise view of resources, costs and demands, coupled with intelligent query, analysis tools and reporting can keep even the biggest organization moving forward in the right direction.

Step four is taking into account scheduling implications because small changes can have big impact. Industry-specific nuances associated with the resource management process, such as time to invoice, can have a significant effect on project costs. Reducing the time and effort required to compile invoices that may need to reflect project codes, work types, pay rates and tax implications can deliver significant benefit to the bottom line.

Step five is compliance. Ensuring compliance with international safety legislation has traditionally been a complex, time-consuming and costly process. The best system should help track end-to-end governance activities, warn of breaches and provide an audit trail that delivers evidence for compliance.

Step six is systems interfacing. Organizations often have different HR or enterprise resource planning systems that are integral to operations. A unified view of the data, rather than replicating across different systems, is essential. A modern WFM system presents all the core scheduling and allied project activities from a single source, providing the data required to make informed business decisions. What's more, if delivered on a software-as-a-service (SaaS) basis, a cloud-based WFM reduces associated IT infrastructure and management costs.

It's clear that no organization applies technology or people in the same way to deliver on projects. Cultural, legal and financial implications color the way many organizations approach business. However, the challenges they face in highly regulated industries are often similar. Using best practices and the latest WFM technology can deliver positive results, rewarding companies with an efficient, streamlined and 360° view of operations. Learn more at: tinyurl.com/y4ycnd2z. **ST**

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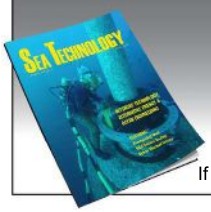

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